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HIGH MOUNTING OF POWERFUL STREET LAMPS.

On other pages of this issue there appears a brief article describing a very interesting development in American street-lighting practice. Its distinctive features are the employment of the new quartz-tube mercury-arc lamps, the high suspension of the lamps and their mounting on the building fronts. These features are not entirely original, for European practice has very successfully made use of them in several notable instances; even in this country high-power lamps have in some places been hung high and in isolated cases from the building front. The combination, however, is new to us for regular street-lighting purposes and is particularly noteworthy because of its admirably successful character.

The installation referred to is at present only one block long on Randolph Street in Chicago, and, although but six lamps are employed, represents commendable illuminating-engineering design. The mean hemispherical candlepower of the lamps is about 2,500, thus making them probably the most powerful single units ever employed for street lighting. The need for mounting such lamps out of the range of ordinary vision is, of course, manifest to anyone who has studied the subject of glare. In this connection the determination of the manufacturers to prevent the low hanging of the lamps, if possible, is to be highly commended. The results of the 40-foot mounting on Randolph Street are the exceptionally uniform illumination over the entire street and sidewalk surface, the lighting up of the building facades, the relative absence of glare, and the non-interference with store-window, sign and border lighting.

Such results have been regarded as among the requirements of ideal street lighting. They do not necessarily require the use of quartz lamps. It is to be regretted that in most arc-lamp installations, and particularly with high-power flame arcs, such results have usually not been secured. The low suspension of powerful lamps invariably produces non-uniform illumination, which is confined to the lower levels, leaving the upper part of the building in gloom; it also produces almost criminal glare and practically spoils the efforts of merchants to light their windows attractively and at reasonable cost. Singularly enough, the early employment of arc lamps in high towers overcame these evils, although it produced but very low intensity of illumination and required high upkeep costs. City authori-

ties should not have allowed such a radical perversion of practice as is represented by hundreds of very low hanging powerful lamps to be found in nearly every large city.

A problem that has prevented the high mounting of high-candlepower lamps is the difficulty of doing so in a practical way and within reasonable cost limits. High lampposts can be used, but this involves increased expense for trimming lamps or the use of a lowering gear. Suspension from the buildings, as on Randolph Street, reduces the investment cost due to high mounting but increases the difficulty and cost of trimming and cleaning; of course, where there is no trimming needed, as with quartz or tungsten lamps, this increased cost of maintenance is small. Suspension from the building fronts does, however, eliminate the need for extra poles and, where there is already a multiplicity of trolley and other poles in a street crowded with traffic, the elimination of any of these is desirable, since it also makes a more sightly street. The center suspension of the lamps on strong cables strung between the opposite buildings is worthy of more serious consideration, since it has been successfully used on many important European streets. Of course, any high mounting of lamps on or between building fronts assumes that buildings of sufficient height are in evidence; in other words, such a system is advisable only on important streets with imposing buildings for the effective and efficient illumination of which high-power lamps are particularly suitable.

BOOSTING THE ELECTRIC VEHICLE.

The necessity for the co-operation of all the interests connected with the electric-vehicle industry was very forcibly brought out at the recent meeting of the Chicago Section of the Electric Vehicle Association of America, of which an account will be found on another page. The manufacturer of electric vehicles, the manufacturer of storage batteries and the central station which supplies current for charging are all deeply interested in the successful use and the extension of applications of this form of vehicle service. The interest of the manufacturers extends to the placing of their products in service, while that of the central station is more permanent.

The advantages of the electric vehicle have often been emphasized in these columns and need not be repeated here. The early weaknesses and defects of this form of vehicle have been overcome and its reputation for reliability, efficiency and economy of maintenance is being more extended as the vehicle users become acquainted with the facts in the case. There remains in many quarters, however, where these facts have not been disseminated, a superstition that the electric vehicle is not entirely satisfactory, and this idea extends even to many central-station men who are in a position to know better. Part of this misapprehension is due to the competitive efforts of salesmen of storage batteries and vehicles who have taken too narrow a view of their interests in the matter and instead of preaching the general advantages of the electric vehicle have been content to praise their own output while creating the impression that the product of all other manufacturers is to be distrusted. Such a policy inevitably reacts upon those who are responsible for it, as the general impression is created among customers that none of the electrical equipment is reliable and efficient. While not claiming that any electrical apparatus has reached the ultimate stage of perfection, it must be insisted that most of the product in the vehicle line which is being placed upon the market is giving satisfactory service and is meeting all of the claims which are honestly made for it. It should be the effort of every representative of this industry to promulgate the general merits of electric operation and not to put emphasis upon whatever minor defects may still exist in any particular output. Salesmen should be satisfied with pointing out the merits of their own particular wares and not dwell upon the defects of other products, creating the impression that the electric vehicle and the apparatus which goes into its construction are not dependable. Such co-operation among manufacturers' representatives will ultimately benefit all and create a more correct and favorable impression among consumers.

The central-station man also has a very large duty to the industry and to his own interests in encouraging the use of this most important adjunct to the station load. Vehicle charging represents a current consumption, which is, or can be made largely an off-peak load, especially when charging is done in public garages rather than with private equipment. With cooking and heating it forms a trio of applications to which the central station must in future look for a vast expansion in its business. For these reasons central-station men should acquaint themselves with the possibilities of the electric vehicle, a procedure which except in the larger cities has generally been neglected. Since faith is developed by works rather than words, central stations should set the example of using electric vehicles for their own trucking and abandon the horse and gasoline machine entirely. The central station should also encourage the establishment of garages in which the vehicle owner can be assured of proper care of his vehicle and should encourage the charging of vehicles in such places. In a majority of cases the private owner is not sufficiently informed upon the subject to properly care for his own battery and the use of private charging plants frequently results in ultimate dissatisfaction with the electric vehicle. Of course where the private owner has the proper knowledge, or where in commercial trucking enough vehicles are employed to warrant the services of an expert for this purpose, there can be no objection to the private care and charging of the vehicle, but with most pleasure vehicles this is not the case.

As in every branch of the electrical industry, and in fact in all the relations of society, co-operation in boosting the electric vehicle will result in a much greater extension of its use and benefit to all the interests concerned.

DATA ON ELECTRIC-LIGHTING INSTALLATIONS.

The need of more complete data in central-station files in connection with revenue-producing motor drives has been emphasized in these columns, but little has been said regarding the similar importance of preserving complete information with reference to lighting installations. The same reasons apply to each branch of central-station practice for the maintenance of something like accuracy and finish in the office records of the card-index or loose-leaf type, which are supposed to give at a moment's call the vital points of each representative installation. As a matter of fact, the sins of omission in this field are at times almost beyond belief. It is not uncommon to visit a central-station office in search of these details of lighting installations of interest, only to find that the company has no record of the number of lamps in service at the place in question, does not even know the kind of lamps used or the size of the important units, and has no idea whatever of the total connected load of the installation, keeping nothing beyond the monthly meter readings in the firm name and the bills resulting from these.

It ought not to be necessary to spend time in criticising such poor practice as this, but it is a fact that electric or any other kind of commercial lighting cannot advance beyond the crudest experimental status unless the more important details of typical and large installations are kept in accessible form. With the tendency toward closer analysis of costs and investments required to serve different classes of customers, which is now evident in many localities, the central station needs a large body of detailed information to work upon in advising its patrons how to get the best and largest amount of light for a given monthly expenditure, both on the part of the company and its customers. It is vital for the company to avoid excessive investments in equipment all the way from the boiler house to the consumer's meter; and it is needless to emphasize the advantages of a proper recommendation of equipment sizes and types to the consumer. The gas people are doing excellent work along the line of advising their customers how to get the most light and how to best utilize it with the least outlay, and as competition grows more acute, nothing short of real engineering data upon lighting installations already in service will enable an electric company to maintain its ascendency.

The information needed includes at least the fundamental data of the existing connected lighting load, covering such items as the number, type, size and voltage of all the lamps known, the size of the meter used, the kind of business supplied, and preferably some details of the dimensions of the principal areas and rooms involved, the wall and ceiling colors, floor material, spacing and height of lamps, type of shades and perhaps some details as to the wiring and switching features employed. Such a survey may be made as complete as time and interest permit, but it should be accurate as far as it goes and never fail to contain at least an approximate total-connected-load item, and if various odd sizes of lamps used in a few exceptional places like corridors, hallways and closets are not tabulated in detail, they should be included in the connected load, determined if necessary by actual measurement with ammeter under the condition of turning on every light in the premises for a short period. The co-operation of the city or town wiring inspectors may be turned to good account in making these surveys of actual installations, and if it appears impracticable to cover the territory thoroughly within a reasonable time, a beginning can at least be made with the largest and most representative establishments. In some degree at least, the central station needs to possess a record of the data regarding its important installations that would be significant to the illuminating engineer in independent practice. Any other policy is short-sighted and bound to retard the legitimate development of electric lighting under competitive conditions.

COST OF ELECTRIC COOKING.

Some interesting data on the actual cost of electric cooking were given in a paper by Mr. H. H. Holmes, which was presented at this year's meeting of the Incorporated Municipal Electrical Association at Harrogate, England. The author stated that the cost of cooking by gas and by electric current was approximately the same when the cost of gas was 60 cents per thousand cubic feet and the cost of electrical energy two cents per kilowatt-hour. With gas at 90 cents, electric current can compete on a cost basis at a price of three cents per kilowatt-hour. But of course cost is not the only thing to be considered.

The average consumption for an English family of eight persons in full and constant occupation of the house, doing the whole of the cooking operations by electricity, but having a separate hot-water supply for baths and washing purposes, works out at 1.9 kilowatt-hours per person per day. This represents well-to-do people, who not only entertain a good deal (often two or three times a week), but even, in the normal way, cook on an extensive scale. The figure given, therefore, represents a maximum consumption for an average well-to-do house. The consumption of a middle-class house would probably be, and by experience often is, as low as one-half to one unit per person per day.

Electric Vehicle Meeting in Chicago.

On September 4 the Chicago Section of the Electric Vehicle Association of America held the first of a series of monthly meetings which will be conducted during the ensuing year. George H. Jones, president of the section, presided at the meeting, which was held at the La Salle Hotel, and was preceded by a luncheon. There were 56 members and guests present.

The first speaker at the meeting was John F. Gilchrist of the Commonwealth Edison Company, who recalled the first electric vehicle which had been operated in Chicago, which was constructed by Sturgis in 1891-92. He estimated the present investment in manufactures connected with the electric-vehicle industry as $250,000,000. He stated that the central stations of the country ought to be doing more than they are in exploiting the electric-vehicle business, since they are the ones who can reap the greatest profit from this development.

Louis E. Burr, president of the Woods Motor Vehicle Company, was the next speaker. He said that the manufacturers were receiving considerable benefit from the formation of such societies as the Electric Vehicle Association, and that they should be doing more for themselves in furthering the business. Greater co-operation between the manufacturers was very desirable, and there should be more attention paid to boosting the individual line of vehicles and less in advertising the weak points of competitors. He referred to some very general evils in the business, such as price-cutting, undue allowance for old machines, free accessories and repairs, etc., and said that the societies should take an active part in trying to correct these evils.

G. H. Atkin, local manager of the Electric Storage Battery Company, made an address in which the same sentiments of co-operation between manufacturers were expressed. He thought that all parties interested in the business should work together instead of trying to run each other down.

E. E. Witherby, manager of the General Vehicle Company, referred to the extensive use of electric trucks in commercial business. He cited as an example that 25 breweries were now using a total of 399 trucks made by his company, the number used by the individual companies varying from two to 83. Engineering principles had now come to be followed in the design of vehicles, which were far superior to those put upon the market ten years ago. The storage battery had also been improved fully 100 per cent. He thought that the battery salesman was largely responsible for some of the bad conditions now existing, such as the uncertain attitude of central-station men towards the electric vehicle, especially in the smaller communities. Many of them are still waiting to have the question of which storage battery is the best one decided. He fully agreed with the previous speakers that there is a crying need for co-operation. Bad garage practice has led to the belief in some quarters that the electric vehicle is a failure. This condition can be cured by lots of missionary work, in which the central stations, battery makers and vehicle manufacturers should join. The average garage man needs education along the lines of giving proper service. Central-station companies should themselves use electric vehicles exclusively and thus demonstrate their faith in them and the possibilities. He thought the officials of the National Electric Light Association should give more attention to this subject. Although the breweries, department stores and express companies have been convinced of the superiority of the electric vehicle, the average central-station man had not yet been convinced and many of them were using gasoline machines. He gave an illustration showing that the central-station man was in this respect neglecting his own interests.

William L. Rugg, president of the Chicago Garage Association, was the last speaker. This association was formed 18 months ago to further the interests of the garage man and of the electric vehicle. They had found it rather difficult to keep the newcomers in the garage business alive to the necessity of co-operation and the maintenance of prices which would produce a remunerative business. He considered the advocacy of private charging plants by central-station men a detriment to the success of the electric vehicle, as in most cases vehicles are not properly cared for under such circumstances.

The chairman stated that the Commonwealth Edison Company was encouraging the use of the public garage and offered a special low off-peak rate to the larger garages.

The meeting closed with an exhibition of moving pictures depicting the electric vehicle parade in Boston last year, the films for which had been loaned by Day Baker of the General Vehicle Company.

Peoria Show.

The directors of the Peoria Show Association have decided to hold the second annual electrical show at the Coliseum in Peoria during the week of January 19, 1913.

The results of the first show held in January of this year were very satisfactory and the exhibitors were well pleased. It is expected to make the show of next year bigger and better in every particular. Arrangements are being made for special entertainment features.

It is expected to send a representative of the Peoria Show Association to attend the Boston Electric Show and have some of the features of that show at Peoria.

Big Plans for the Jovian Congress Next Month.

The Pittsburgh Jovians are making elaborate plans for the annual meeting of the Rejuvenated Sons of Jove, which will be held at Pittsburgh, Pa., October 14, 15 and 16.

The hotel committee has selected the Fort Pitt Hotel as official headquarters, and it is urgently necessary that immediate reservations be made so that no one will be neglected. The hotel committee suggests that Jovians who will attend the meeting write to the hotel direct.

The banquet will be held on the evening of October 16, and the plans have been completed. The number of banqueters will be limited to 500, and early reservations will be necessary. The charge will be $3.00, including wine, cigars and a royal good time.

Special arrangements are being made for the entertainment of the ladies, and in making reservations for hotel accommodations and the banquet it is desirable that the local committee be informed with respect to the number of ladies that may be expected.

The hotel committee includes H. B. Kirkland, Chairman, S. A. Chase, G. B. Griffin, W. C. Jones and T. G. Seixas.

Columbus Gets New System of Street Lighting.

One of the features of the Ohio-Columbus celebration which was inaugurated on the evening of Monday, August 26, at Columbus, O., was the turning on of the lights in the new cluster-lighting system throughout the city.

For a long time the city of Columbus enjoyed a spectacular system of arch incandescent and arc lighting. For a couple of years plans have been developing and an extensive ornamental standard incandescent street lighting system has been in process of installation.

There are 866 clusters and 30 alley lights in the system. In addition to this, however, the 37 street arches and the 125 arc lights in the cluster district were continued during the Centennial celebration.

Illumination in Findlay.

The electrically illuminated arches which were erected on Main Street, Findlay, O., for the recent centennial celebration have proved so popular that the City Council has taken action to make them permanent.

Trust Prosecution in Texas.

James D. Walthall, who became attorney-general of Texas on September 1 to fill out the unexpired term of Jewell P. Lightfoot, resigned, announces that he will soon reopen the investigation that was recently conducted by that department into the operations in Texas of the alleged electrical trust. The last legislature passed a resolution directing the attorney general to investigate this alleged trust and to institute proceedings against it for violating the anti-trust laws, if the charges which were made of its guilt were well founded. The investigation was conducted by Mr. Lightfoot, who made an exhaustive report on the subject, in which he gave the several concerns that were alleged to be in the trust a clean bill of health. Mr. Walthall has received additional information it is claimed, which leads him to believe there exists an illegal combination between different electrical companies, and he is arranging to gather the necessary evidence to file suits against them for heavy penalties and their ouster from Texas. The concerns alleged to be involved in the trust law violations are the Stone & Webster Engineering Corporation and its several subsidiary corporations operating in the state; the Texas Light and Power Company, which recently acquired a number of electric light and power plants in North Texas; the Southwestern Telegraph and Telephone Company of Dallas, which is a subsidiary of the American Telegraph and Telephone Company; the Western Union Telegraph Company; the Texas Postal Telegraph Company, the latter being owned by the same interests as the Western Union Telegraph Company and the Southwestern Telegraph and Telephone Company. The Stone & Webster Engineering corporation has been very active in interurban electric-railway construction in Texas during the last several months. The Southwestern Telegraph and Telephone Company has recently made extensive additions to its holdings in this state by acquiring properties of independent telephone companies.

Pay-as-you-enter cars were introduced on the Gateshead, Newcastle, tram lines, on June 25, the first of the kind in England.

M. I. Pupin.

One of the most distinguished men of science, one who has achieved great things in physics and electricity, and whose researches and inventions have led to practical applications embodying commercial ideas of great magnitude, is the subject of this sketch, M. I. Pupin.

Michael Idvorsky Pupin was born on the southern frontier of Austria-Hungary in 1858. He is of pure Servian ancestry and blood, although born in Hungary, and his family was one of the famous five hundred that left Servia some 250 odd years ago at the behest of the Hapsburg then reigning over Austria-Hungary. These families settled upon the frontier of Hungary and performed great service in its defense against Turkish aggression.

Michael I. Pupin,
Professor of Electromechanics, Columbia University.

He came to America in 1874, when he was a little under sixteen years of age, and after many vicissitudes obtained a scholarship at Adelphi Academy, Brooklyn, and graduated from this institution. He entered Columbia University in 1879, at the age of 21, and graduated at the head of his class in 1883. He then went to Europe, studying in Cambridge and Berlin, and later on studying under Helmholtz, Bunsen and Kirchhoff.

In 1889 he was appointed instructor in Columbia University, later on being made full professor of electromechanics at that institution.

Although Dr. Pupin has devoted a large part of his time to the working out of many problems in physics and electricity, he is undoubtedly best known as a world figure for his researches in long-distance telephony. It was in 1895 that he began the series of experiments which were made known to the world the early part of 1901. His great invention, which was the result of a painstaking mathematical study and a long period of experimenting, is the Pupin loading coil which was acquired by the American Telephone & Telegraph Company for a large cash reward and a very comfortable annuity. The Pupin loading coil has been applied practically to thousands of miles of telephone cable, and today is in successful use on long-distance telephone circuits between New York and Boston, New York and Philadelphia, New York and Chicago, New York and Denver, and other long-distance lines for the transmission of telephonic communication.

Boston Street Lighting.

Mayor John F. Fitzgerald, of Boston, has instituted an investigation of the relative cost and desirability of installing electric lights, in place of the present gas lamps, in the parks, alleys and side streets of the city. The mayor states that it has been determined roughly that $60,000 a year would be saved over the present system of new Graetzin lamps, and furthermore that there would be no expense for installation. In the event of the substitution of electricity for gas in the minor localities referred to, the whole lighting service of the city would be furnished by the Edison Electric Illuminating Company. The contract for gas lighting is about to expire.

Reading Company Section.

The employees of the Metropolitan Electric Company of Reading, Pa., have formed a company section of the National Electric Light Association, Clayton Geiger has been elected chairman and H. D. Ingle, secretary.

The value of the imports of mica into the United States has for many years, except only 1908, greatly exceeded that of the domestic production.

Annual Meeting of the International Association of Municipal Electricians.

The annual meeting of the Municipal Electricians was held at The Jefferson Hotel, Peoria, Ill., August, 27, 28, 29 and 30. The meeting was opened Tuesday morning by President J. W. Kelly, who introduced Mayor Woodruff of Peoria, who delivered an address of welcome to the convention. A reply was made by E. N. Neill, of Harrisburg, Pa. One hundred and fifty delegates were registered at the opening of the convention and more came later during the sessions.

Louis Gascoin, of Detroit, Mich., read a paper on "Cable Bonding" that was well received. W. S. Develin, of Pittsburgh, Pa., read a paper on "Underground Cables," in which he brought out several different facts that were of much interest to the convention. He was followed by T. C. O'Hearn, of Cambridge, Mass., who read a paper on "Grounding Street Boxes," in which he gave the convention some of his experiences and also pointers on the finding of trouble in fire-alarm circuits. After this paper the convention adjourned for the day and spent the remainder of the afternoon at Ringling's Circus, which was in the city that day.

In the evening, President Kelly gave a demonstration of high-tension experiments, using 500,000 volts from a Tesla coil, through the courtesy of the Camden Electrical Company, of Camden, N. J., which loaned the coil and the appliances.

The Wednesday morning session was opened by A. M. Klingman, of the street-lighting department of the General Electric Company, who delivered a paper on street lighting. He mentioned that Peoria was now one of the best lighted cities in the country and he was well pleased with the way it had been done. At the conclusion of his address a large number of slides were shown, giving views of street lighting in different cities in the country and how the street-lighting problem was being solved by the various municipalities.

A paper was read by W. L. Reihl, of Cincinnati, O., on "The Method of Testing and Installing Fire-Alarm Boxes." John Berry presented one on "Handling Fire Alarms" which was the subject for discussion in which many members took part. In the afternoon the members with their wives and the guests were photographed, and then took the boat for the trip up the river.

In the evening a rejuvenation of the Sons of Jove was held and seven candidates were taken in, after which a supper was given to which all the delegates and the ladies were invited.

The Thursday session was opened by W. S. Boyd, who read a paper on "Electrical Inspection from the Underwriters' Standpoint." This was one of the best papers of the convention and was well received by the delegates. Charles Linn then read a paper on "Municipal Inspection—and Why?" This paper made a decided impression on the members and he was applauded several times as he made his points on the necessity of inspection and that it should be thorough and well done to be worth any thing at all.

In the afternoon session W. E. Wolgamott, city electrician of Peoria, gave a talk on the flash-light system of police calls as installed in the city of Peoria, which system is the largest that has been installed to date, and went on to describe how it operated by flash light at night and by a bell during the day.

Leo Firman, of Philadelphia, Pa., read a paper on "Locating and Clearing Trouble on Lines and Cables," and in this he described a new device of his that is a decided time saver and gave him a good deal of satisfaction.

Watertown, N. Y., was selected as the place to hold the meeting next year.

The following officers were elected:

President, John W. Kelly, of Camden, N. J.

First Vice-President, O. C. Trussler, of Indianapolis, Ind.

Second Vice-President, W. H. Arbuckle, of Bayonne, N. J.

Third Vice-President, A. G. Sangster, of Saskatoon, Saskatchewan.

Fourth Vice-President, V. A. Blakey, of Montgomery, Ala.

Secretary, Clarence R. George, Houston, Tex.

Treasurer, C. I. Diehle, Harrisburg, Pa.

Finance Committee, W. Flandrau, Mount Vernon, N. Y., chairman; P. H. McManus, Wilkesbarre, Pa.; J. Leary Hammond, Indiana.

Executive Committee, H. C. Bundy, Watertown, N. Y., chairman; T. C. O'Hearn, Cambridge, Mass.; William V. Elliott, Elmira, N. Y.; W. E. Wolgamott, Peoria, Ill.; A. I. W. Kittredge, New Haven, Conn.; C. W. Pike, Philadelphia, Pa.; H. A. Bowen, Cleveland, O.; W. B. Martin, Albany, N. Y.; John Berry, Indianapolis, Ind.; Robert J. Gaskill, Fort Wayne, Ind.

A good deal of discussion was brought up on the combining of the offices of secretary and treasurer, which was finally settled when C. I. Diehle refused to serve in both offices.

In connection with the convention the Gamewell Company, which installed a large exhibit in the convention hall, gave the visitors a dinner on Friday night. The Gamewell Company had a large exhibit in working order of both the fire-alarm system and the police calls as manufactured and installed both for city use and for individual plants, especially the auxiliary system to attach from a factory to the regular fire-alarm system.

The H. W. Johns-Manville Company had an exhibit of the various products manufactured and sold by them, including fiber conduit, inclosed fuses and entrance cutouts of various types.

The Central Electric Company, of Chicago, had an exhibit including especially the Okonite products.

The Detroit Fuse Manufacturing Company had an exhibit of fuses and iron-clad switches.

The Nelite Works of the General Electric Company, had an exhibit of glassware.

The I. A. Bennett Company had an exhibit of the metal molding and fittings manufactured by the National Metal Molding Company, for which it is the western agent.

C. S. Knowles and Pass & Seymour were among the exhibitors.

The Duplex Metal Works showed copper-clad wire.

These exhibitors, with the other houses which had representatives on the ground but no exhibit, made a good attendance of the supply men.

Each delegate and guest was provided with a neat badge, the top of which was a key on which was "Peoria," and the name of the individual, and hung from this was a medal on which was inscribed the name of the association and the date of the meeting.

In all, the convention was well attended and much good was derived both by the members and the guests, many of whom brought their wives with them. The entertainment features were not overlooked and the steamboat ride, trolley parties and dinners were thoroughly enjoyed.

Luminous Arcs in Utica, N. Y.

Sixty luminous or magnetite arc lamps mounted on ornamental standards have been installed on Genesee Street from Washington Street to Bagg's Square. The merchants contributed $1.99 per front foot to pay for the installation and operation, including current from August 21 to January 1 next. After New Year the city will assume the operating and upkeep costs. The lamps were supplied by the General Electric Company and the standards by the Ornamental Lighting Pole Company, of New York. Sixteen such lamps will also be installed along the Parkway.

Electricity in Creameries.

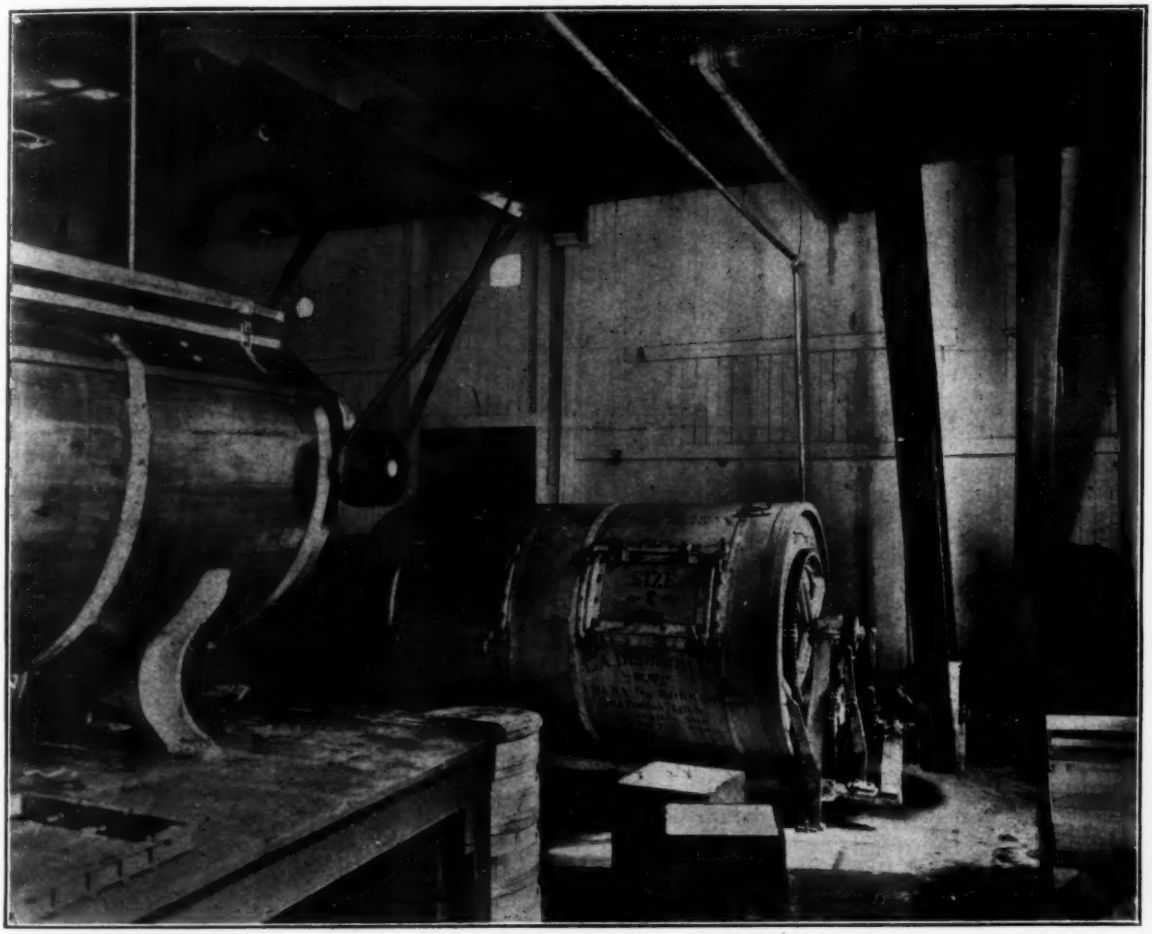
This article analyzes the operating conditions in creameries, discussing the machine and motor characteristics and gives considerable data on motor-driven refrigeration as applied to such plants. Tabulated information from numerous plants is given in the data sheets.

While statistics show that a majority of the creameries supplying butter to this country are located in rural districts, outside of the range of central-station service, still the number of plants located in towns and cities is large, and, with the increasing tendency of central stations to extend service to outlying districts a large percentage of butter-making plants will be in a position to enjoy the benefits of central-station service.

Steam and hot water in large quantities are essential to every creamery and for this reason it is commonly considered that this industry offers practically no field for the sale of electric energy. Inasmuch as heat is necessary for sterlizing the milk, a steam engine is usually the first thought of the proprietor. In addition to the heat needed for pasteurization, frequently a great amount of hot water is used for cleaning milk bottles, cans and apparatus. Naturally, then, many creamery managers are skeptical about motor drive. Theoretically it is probably true that the additional coal for sustaining sufficient boiler pressure to operate the engine is negligible when compared with the fuel needed solely to obtain steam for the purposes mentioned, and the engine therefore performs the functions of the cheap and effective reducing valve between boiler and heating system, practically generating at no cost the mechanical power required.

In actual practice, however, the average small creamery labors against serious wastes in boiler and engine room, due to careless firing, leaky pipes and valves, and encounters decrease in production, due to belt slippage and poor speed regulation, friction losses and bearing trouble accompanying long lines of shafting, dependence upon one prime mover for continuous operation, enormous expense for repairs, etc. When these points are considered it is to be questioned whether the coal- pile argument may not be justly regulated to a position of minor importance.

In come creameries, pasteurizers, washers, etc., use live steam, hence a large portion of the total steam generated must be delivered at boiler pressure. In determining the thermal value of the exhaust from the low-pressure engine, due consideration must be given to such variables, as initial gauge pressure and point of engine cut-off, also taking into consideration radiation losses and leaks in main piping, engine cylinder, etc. While under the best conditions it may be



Three-Horsepower Motor Belted to a Line Shaft Driving Creamery Machines. Marinette Produce Company.

possible to realize at boiler pressure, 90 per cent of the heat units contained in the steam at boiler pressure, approximately one-quarter of this amount must be used for heating boiler-feed water, and after deducting for ineefficient pipe and cylinder lagging, badly packed glands, leaky valves and joints, and the loss chargeable to engine repair and depreciation, as well as the additional expenditure for oil, waste, packing, etc., it is evident that the value of the thermal units remaining for useful work may be considerably reduced. Also, when steam is used for supplying both power and heat, well sustained and constant gauge pressure is indispensable, if the gauge and the various driven machines are to be kept at normal speed and maximum rate of production.

The arguments to be used in favor of the electric motor drive are flexibility, readiness and cleanliness. The latter is an especially strong point because one of the reasons this modern equipment is being installed is to guard against dirt and disease. As to readiness, the motor is constantly ready at any hour, and the expense stops when the current is shut off. Steam for an engine must be looked to in advance. The low pressure required for the heating obviates the necessity for a licensed engineer and a higher heat efficiency is possible. The size of the low-pressure boiler required may be readily figured from the accompanying table showing the amount of steam required for pasteurizing:

240 quarts of milk require	2-horsepower boiler.
400 quarts of milk require	3-horsepower boiler.
800 quarts of milk require	5-horsepower boiler.
1400 quarts of milk require	6-horsepower boiler.
2600 quarts of milk require	8-horsepower boiler.

If any preference is given for off-peak business, it is especially applicable here, as very little power is used in the cold months, or during the evening hours. When the best use is made of the water obtainable ordinarily, 50 per cent of the cooling can be done before calling the refrigerating machine into service.

The motor requirements of the average creamery are simple, as all machines run at constant speed. Most of the motors must start under load, unless there is provision of a clutch to be thrown in after attaining speed.

For the operation of separators, a small motor can be assembled with the separator upon a common base or mounted on a shelf which is supported by the separator body. Where large separators are used the heavier motors required may be mounted on the floor, wall or ceiling and belt—connected to the separator. For small sizes light belts are generally used, and on account of the short centers between motor and separator, the pulleys are provided with belt tighteners, with some types of separators, vertical-shaft motors are used, in which case they form an integral part of the separator.

For driving rotory churns, motors can usually be direct-geared to the operating mechanism of the churn and the gearing completely inclosed, insuring absolute cleanliness and rendering possible the manufacture of butter under perfectly sanitary conditions. For the operaton of barrel or factory-type churns the motors are connected either through gears or belts, and auxiliary belting or gearing can be arranged so that one motor will drive both churn and butter-worker. Where it is necessary to pump the milk into the churn, it is customary to use small centrifugal or reciprocating pumps. When pumps of the former type are used, the motor, on account of its high speed characteristics, can usually be connected direct to the pump shaft, thereby forming a compact, self-contained unit. For the reciprocating type of milk pump it is of course, necessary to interpose gearing or belting.

Practically all the auxiliary apparatus in a modern dairy, such as bottle and can washers, pasteurizers, testers, etc., can be readily equipped with motor drive. The separators and most of the auxiliary machines in the average dairy require very little power for their operation. Where the dairy machinery is compactly arranged it may be found economical to drive it by means of a single motor with the necessary belt connections between the main shaft and the individual machines.

The motor requirements of creamery machines may be summarized as follows.

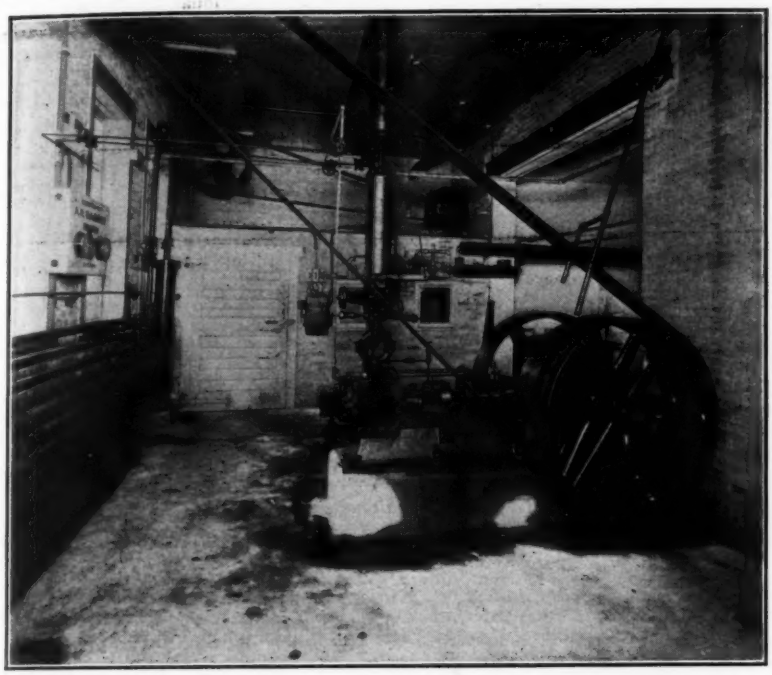
Machine	Horsepower
Churn	1 to 2
Buttermilk machine	2
Pasteurizer	2
Conveyor	2 to 5
Well Pump	1 to 7.5
Cream separator	0.25 to 1
Bottle washer	5 to 10
Can washer	3 to 5
Refrigerating machine	
Per ton of capacity	2

The increasing price of natural ice has made the use of a mechanical refrigeration plant more economical in many industries. The latter has other advantages which make its installation desirable, even where the cost is the same. These are the absence of the labor and annoyance of charging the system with ice, and the attendant dirt, water and confusion resulting. There is also entire independence of the ice man. No disease germs can be brought into the ice box by dirty ice made from impure water. The air in the storage chamber is dry and is cooler than is possible with ice. Air in an ice-cooled refrigerator must be moist and will cause mould to grow if given sufficient time.

In creameries it is especially desirable to be able to control the temperature of the cream while the ripening process is going on, and it is also imperative to be able to check any further fermentation when the proper acidity is reached. These are all important points in the science of modern butter making, and can only be ac-

Motor-Driven Churns, Marinette Produce Company, Marinette, Wis.

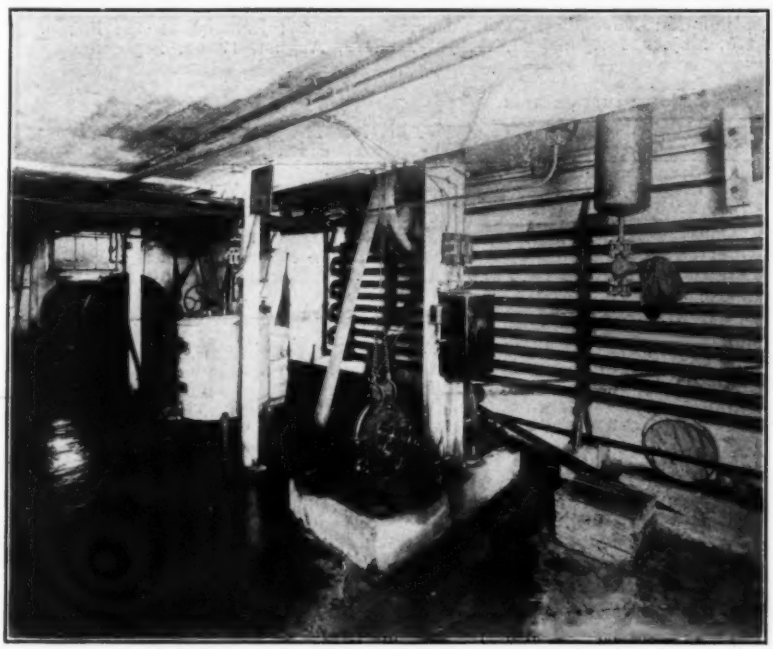
complished by means of mechanical refrigeration. Such a creamery can at all times turn out a fine uniform grade



Motor Driving Eight-Ton Ammonia Compressor, Pottswood Creamery, Appleton.

of butter. Without a mechanical plant it is impossible to control the temperature, and the product will be non-uniform, which means that it will be impossible to obtain the top market price for the product.

In large as well as small installations, very little attention is required, for the motor may be started and stopped by the usual small switch. In this way it may be operated part of the time, producing sufficient cooling to maintain the desried temperature during the night.



Five-Horsepower Motor Driving Group of Creamery Machines, Frank Creamery, Neenah, Wis.

Refrigeration plants when making ice are rated at the number of pounds or tons they can make per 24-hour day. If used for refrigeration only, they are rated in pounds or tons as before, but as the number of pounds of melting ice that would be required to produce equivalent refrigeration. A plant making 10 tons of ice would be equivalent to the melting of 18 or 20 tons of ice. This is due to the fact that it takes practically the same time to freeze the ice as to melt it, and hence the actual refrigeration capacity must be the sum of making and melting the ice. Hence a refrigeration plant will make ice to six-tenths or one-half of its rated refrigeration capacity.

A very large per cent of all the plants in use operate on the compression system, using ammonia. All figures given hereafter apply to this system. The absorption system, the absorption and compression system combined, and the compression system using carbon dioxide, air, or other gas, constitute the remainder.

The fundamental parts of a compression system are:

(1) A compressor in which the gas is compressed.

(2) A condenser, which cools the gas delivered to it by the compressor causing liquefaction. This cooling is done from a water supply.

(3) A valve through which the liquid expands and vaporizes into.

(4) A coil of pipe placed in the cooling chamber.

The liquid in changing to a gas takes heat from the surrounding bodies, and hence cools them. In the coil of pipe the actual refrigeration is produced. From this coil the compressor exhausts the gas to compress it again and so uses it over and over.

Frequently it is desired to run a plant but part of the time, so that a storage of cold must be provided for. This is done by a brine tank, which will maintain the temperature practically uniform while the machine is shut down. In other cases brine is used as in ice making plants, because it is possible to provide a small circulating pump to keep the temperature required, and will also retain its low temperature for a considerable length of time.

The refrigerating load is essentially a day load and even where it is run during the night also, arrangement may ordinarily be made to shut it down during the peak load in the evening. For this reason it presents the most attractive load possible from the central-station point of view, as it is steady and lasts all day.

There are two distinct forms of refrigeration systems in common use. The first is used in the smaller sizes, and is in reality a refrigerating chest similar to the usual ice chests, but is supplied with a small compressor and refrigerating outfit driven by a motor

(Continued on page 445)

Creamery Data—Sheet No. 1.

The term load-factor is used in these data in such a sense that a load-factor of 100 per cent represents the use for 24 hours every day of power corresponding to the rated capacity of the motors connected. An operating-time load-factor of 100 per cent represents the use of the rated capacity of the motors for the running hours per day specified for each installation.

Mankato Dairy Company, Mankato, Minn. General creamery business. Group drive. Running hours per week, 48.

Total connected horsepower, 3. One squirrel-cage induction motor is installed. Average kilowatt-hours per month, 205. Average kilowatt-hours per month per horsepower connected, 68.

Kilowatt-hour consumption for 12 months:

Month.	Kilowatt-hours.	Month.	Kilowatt-hours.	Month.	Kilowatt-hours.
January	148	May	249	September	249
February	137	June	361	October	163
March	145	July	307	November	129
April	174	August	272	December	126

Load-factor, 14.4 per cent; operating-time load-factor, 32.8 per cent.

Motor Installation.

The following are the machines connected to the motor. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horsepower.	Speed R. P. M.	Application.
1	3	1,800	Belted to a line shaft driving one disk continuous ice-cream freezer, capacity 75 gallons per hour, made by the Creamery Package Company; one No. 54 Creese ice crusher, capacity 5,000 pounds per hour; one Disbraw 80-gallon churn, manufactured by the Owatonna Manufacturing Company; one Wizard milk mixer, capacity 100 gallons, made by the Creamery Package Company; one Alpha cream separator, capacity 2,000 pounds per hour; one Farrington No. 2 duplex pasteurizer, capacity 2,000 pounds per hour; and four centrifugal pumps, capacity 5,000 pounds per hour each.

Energy is supplied by the Consumers' Power Company.

Creamery operated in connection with a large dairy farm.

Total connected horsepower, 93. Total number of motors installed, 9. Average kilowatt-hours per month, 9,749.

Kilowatt-hour consumption for 12 months: November, 20,437; December, 13,987; January, 11,999; February, 13,110; March, 12,006; April, 16,215; May, 9,274; June, 11,021; July, 13,972; August, 17,332; September, 23,808; October, 28,830.

Load-factor, 19 per cent.

Motor Installation.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts. All motors except where indicated are of the squirrel-cage, induction type.

No.	Horsepower.	Speed R. P. M.	Application.
1	20	1,120	Slip-ring motor belted to a Remington Machine Company's vertical ammonia compressor, rated at 12 tons of refrigeration per 24 hours.
1	35	850	Slip-ring motor belted to a 10-foot shaft at each end of which is connected a Remington Machine Company's ammonia compressor, rated at 8 tons of refrigeration per 24 hours.
1	3	1,700	Geared to a 3.5-inch by 6-inch triplex brine circulating pump, 12 degrees Fahrenheit maintained in brine.
1	5	1,700	Belted to a six-foot shaft (three hangers), driving two Gould's 5-inch by 6-inch air compressors, 180 revolutions per minute, 32 pounds pressure. These compressors operate an air lift in a 300-foot well in which the water rises to within 60 feet of the surface. The lift handles about 40 gallons per minute.
1	10	1,120	Belted to an 18-foot shaft (five hangers), and two short countershafts driving one Manton-Ganlin B, No. 1 homogenizer for mixing buttermilk; one pasteurizer; one small milk pump for pasteurizer; one 24-inch disk fan; one Reid's "Improved Danish" separator; and one Crown Cork & Seal Company's bottle capper.
1	1	1,700	Belted to a 15-foot shaft (three hangers), driving one Creasey ice breaker, 15-inch by 15-inch cake; one 23-degree, 15-foot inclined conveyor, carrying cases of bottled milk.
1	15	1,120	Belted through a 30-foot shaft (six hangers) to a Rice & Adams bottle washer and steamer. Consists of two small 14-inch centrifugal pumps which force a spray of hot water into the bottles.
1	2	1,700	Belted to a 15-foot shaft and a 15-foot countershaft, driving one 60-inch by 30-inch churn, capacity 400 pounds per churn, requiring 40 to 45 minutes; and one butter worker, having 5-foot table.
1	2	1,700	Belted direct to can washer.

Creamery Data—Sheet No. 2.

Ice cream, milk and butter plant having a daily output of 700 gallons of milk, 500 pounds of butter and 500 gallons of ice cream. Three men are employed working 10 hours per day.

Total connected horsepower, 12.25. Total number of motors installed, 4. Average kilowatt-hours per month, 842.

Kilowatt-hour consumption for 9 months. April, 386; May, 809; June, 713; July, 1,298; August, 1,126; September, 994; October, 757; November, 727; December, 767.

Load-factor, 12.6 per cent; operating-time load-factor, 35.9 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed, with their respective drives. The supply source is three-phase, 60 cycles, 200 volts. Motors are of the squirrel-cage induction type.

No.	Horse-power.	Speed R. P. M.	Application.
1	5	1,720	Belted to a 25-foot shaft (five hangers) and a 6-foot countershaft (two hangers) driving one 300-gallon butter churn; two Confectioners & Bakers Supply Company 40-quart ice-cream freezers; and one Creasy No. 51 ice breaker.
1	5	1,720	Belted to a 20-foot shaft (four hangers) and a 44-foot countershaft (eight hangers) driving one Farrington 3,000-pound pasteurizer; one De Laval 3,000-pound separator; one brine pump; one boiler pump; and one milk agitator, operating six hours per day.
1	2	1,720	Geared to a 4,000-pound freight elevator.
1	0.25	1,700	Direct-connected to brush bottle washer.

Harry Frank Company, Neenah, Wis. General creamery business, the monthly output being 30,000 pounds of butter. Four men are employed working 11 hours per day. Machines are in use about 5 hours.

Total connected horsepower, 20. Total number of motors installed, 4. Average kilowatt-hours per month, 602.

Kilowatt-hour consumption for 14 months: June, 577; July, 503; August, 431; September, 460; October, 432; November, 295; December, 246; January, 265; February, 213; March, 297; April, 277; May, 1,108; June, 1,516; July, 1,823.

Load-factor, 5.5 per cent; operating-time load-factor, 10.6 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed, with their respective drives. The supply source is three-phase, 60 cycles, 440 volts:

No.	Horse-power.	Speed R. P. M.	Application.
1	2	1,800	Belted to a 16-foot line shaft driving one 2,500-pound De Laval separator; one small rotary pump; one Sanitary pump; and one can washer.
1	5	1,800	Belted to 10-foot line shaft driving one 1,100-pound churn; two cooling vats, 500 gallons capacity each; one rotary pump; one brine pump; and one starter can.
1	10	1,200	Belted direct to one 8-ton Vilter Manufacturing Company ice machine, used only in summer.
1	3	1,800	Belted direct to 1.5-ton freight elevator.

Energy is supplied by the Wisconsin Traction Light, Heat & Power Company, Appleton, Wis.

The Potts-Wood Company, Appleton, Wis. This plant has an average daily output of 500 pounds of butter. Four men are employed, working 5 hours per day.

Total connected horsepower, 21. Total number of motors installed, 3. Average kilowatt-hours per month, 1,777.

Kilowatt-hour consumption for 3 months: May, 1,133; June, 2,006; July, 2,183.

Load-factor, 15.5 per cent; operating-time load-factor, 68 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 440 volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	5	1,800	Belted to a line shaft driving two De Laval separators, capacity 6,000 pounds an hour each; one new Sanitary pump; one Miller pasteurizer; one 300-gallon pasteurizer; one can washer; and one Mills 900-pound churn.
1	1	1,800	Direct-connected to brine pump.
1	15	900	Belted to line shaft driving one White 6-ton ice machine; and one Gould's plunger pump, capacity 16 gallons per minute

Energy is supplied by the Wisconsin Traction, Light, Heat & Power Company, Appleton.

Creamery Data—Sheet No. 3.

Creamery, located in Wisconsin. Combination drive. Running hours per week, 168.

Total connected horsepower, 77.5. Total number of motors installed, 6. Average kilowatt-hours per month, 16,263. Average kilowatt-hours per month per horsepower connected, 210.

Kilowatt-hour consumption for 10 months: January, 13,020; February, 9,810; March, 8,000; April, 11,690; May, 18,590; June, 20,480; July, 20,790; August, 25,610; September, 17,300; October, 17,340.

Load-factor, 38.6 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	50	900	Belted to line shaft driving one 25-ton Harris ice machine; one freight elevator; and two 4 by 5 circulating pumps.
1	2	1,200	Belted direct to one brine circulating pump.
2	10	1,200	Belted to line shaft, each driving two churns; five ripeners; one pasteurizer; and one tester.
1	5	1,800	Belted direct to one casein grinder.
1	0.5	1,800	Belted direct to one triplex oil pump for furnishing oil for boiler fuel.

Marinette Produce Company, Marinette, Wis. This plant has an average output of 4,000 pounds of butter per week. Two men are employed.

Total connected horsepower, 5. One squirrel-cage induction motor is installed. Average kilowatt-hours per month, 76.

Kilowatt-hour consumption for 12 months:

Month.	Kilowatt-hours.	Month.	Kilowatt-hours.	Month.	Kilowatt-hours.
July	152	November	53	March	46
August	134	December	28	April	30
September	131	January	20	May	61
October	83	February	34	June	125

Load-factor, 2.7 per cent.

MOTOR INSTALLATION.

The following are the machines connected to the motor. The supply source is three-phase, 60 cycles, 440 volts

No.	Horse-power.	Speed R. P. M.	Application.
1	5	1,800	Belted to a line shaft driving one 800-pound combinted churn and butter worker; one 400-pound cream ripener; one small ice-cream freezer; and one ice crusher.

Energy is supplied by the Menominee & Marinette Light & Traction Company.

Central Creamery, Ferndale, Cal. Combination drive. Running hours per week, 168.

Total connected horsepower, 98.5. Total number of motors installed, 13. Average kilowatt-hours per month, 17,088. Average kilowatt-hours per month per connected horsepower, 173.48.

Kilowatt-hour consumption for 5 months: June, 17,570; July, 17,440; August, 17,490; September, 17,340; October, 15,600.

Load-factor, 32 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	15	1,200	Belted to line shaft driving one 10-ton Harris ice machine; and one brine circulating pump.
1	10	1,200	Belted to line shaft driving seven ripeners; two churns; and one cooler.
1	15	1,200	Belted to line shaft driving two separators; one cooler; one pasteurizer; two milk hoists; four ripeners; one 4 by 5 high-pressure triplex pump; and one 5 by 7 circulating pump.
1	5	1,200	Belted to line shaft driving one 5 by 9 high-pressure triplex pump; one heater; and one one-inch centrifugal pump.
1	15	200	Belted to line shaft driving one freight elevator; one drying blower; one milk shaker; and one ventilating fan.
1	1	1,800	Belted direct to one 4 by 5 brine circulating pump.
1	5	1,800	Belted to line shaft driving two separators; one pasteurizer; and one milk hoist.
1	7.5	1,200	Belted to line shaft driving one 4 by 5-inch high-pressure triplex pump; one brine circulating pump; two ripeners; and one can filler.
1	5	1,800	Belted direct to one hot-air blower.
1	7.5	1,200	Belted direct to one casein grinder.
1	7.5	1,800	Belted to line shaft driving one casein hoist; one casein grinder; and one hot-air blower.
1	2	1,800	Belted to line shaft driving one can sealer; and one butter tamper.
2	1	1,800	Each belted direct to a triplex water pump.

Energy is supplied by the Ferndale Electric Light Company.

which is outside of the chest. Brine is used to maintain a low temperature during the night, for the machine is intended to be operated but eight to twelve hours per day. This is a portable plant in that it may be moved as a unit and placed in the most desirable place.

The larger sizes consist of the refrigerating apparatus used in cooling rooms that are a part of the building and are not self-contained installations. Such outfits are extensively used where the larger sizes are required.

The determination of the correct equipment to use in a given case can be made approximately without consulting a refrigerating engineer, but the layout of the installation, if of the larger sizes, should be left in his hands, as it represents an engineering question that usually requires expert knowledge. However, approximate information on the capacity required may be given a prospective customer by the use of the information which follows.

The capacity of the machine depends upon how much work is to be done and also upon the length of time the equipment is to be operated each day. In many cases it is preferred to operate the machine only ten or twelve hours a day, shutting it down while the premises are vacant. This merely means that a machine is required about twice as large as one which would do the same work if it operated twenty-four hours a day. However, the expense in operating the smaller machine for twenty-four hours is somewhat greater than for the larger machine running a shorter time. The larger capacity allows for future increase by running the machine a longer time.

The smaller outfits which include the chest may be readily figured from the approximate ice consumption required by ice chests. These outfits are manufactured in the standard sizes of 250 and 500 pounds of refrigeration for twenty-four hours, but will operate satisfactorily where less refrigeration is required. The time of operation and the cost for power is reduced in proportion to the reduction in refrigeration. They are usually run from ten to twelve hours a day. Space is provided in each for making ten pounds of ice in ten hours, for ice water or other use.

For the larger outfits, the amount of ice previously consumed is not accurate as a basis in determining the size of compressor to install, nor can it be used where it is required to figure on an entirely new equipment. However, a very satisfactory estimate may be made from the size of the compartments to be cooled and the temperature which is to be maintained. It is impossible to give a figure which shall show, in all cases, how many cubic feet of space may be cooled by a one-ton machine for different temperatures because this depends upon the size of the room, even with the same insulation. That is, in a room of 100,000 cubic feet, an 8.25-ton machine would be required to keep it at 24 degrees, whereas with a room of 1,000 cubic feet a one-sixth ton machine is required under the same conditions, instead of as might be supposed only one one-hundredth part of eight and one-quarter tons. This is due to the fact that there is more wall surface per cubic foot in the smaller room than in the larger, and as the heat comes into the room in proportion to the wall area, the small rooms require relatively more refrigeration capacity.

The following table shows the motor capacity required to operate the different machines:

Capacity Tons Refrigeration	Horsepower Required
0.5	2
1	3
2	5
4	7.5
5	10
7.5	15
10	15
15	25
20	35
30	50
40	65
50	80

These capacities are based on 24-hour continuous operation of the compressor; if operation is reduced to 12 hours the refrigeration capacity is likewise reduced one-half.

The preceding tables of horsepower required are based on condensing water at 60 degrees. This is an important point, for the power required from the motor will be increased if the temperature of the water is higher than 60 degrees. In most localities as low a temperature may be obtained even in summer.

With reference to the type of motor used, it should be noted that the load varies widely during each stroke unless two-cylinder compression is used, as in the larger sizes; for this reason it is advisable to use a constant-speed induction motor, or a shunt or compound-wound direct-current motor. For the single-cylinder compressor it is recommended that the motor be belt connected rather than chain or gear connected, because of the fluctuations in the load. The speed of the compressor should be as indicated in the tables.

The following will serve as a guide in estimating on the refrigeration capacity. One ton capacity will lower the temperature of 1,200 gallons of milk or 1,500 gallons of cream 30 degrees, that is, reduce it from 70 degrees to 40 degrees, or 75 degrees to 45 degrees, etc. If it is desired to reduce the temperature more than 30 degrees, less milk may be cooled per ton of refrigeration, for instance, 600 gallons of milk may be cooled 60 degrees, or more may be cooled a less number of degrees, the amount cooled being in inverse proportion to the degrees of cooling.

It is instructive to compare the cost of refrigeration by ice and by a mechanical plant, where the requirements are one ton of ice a day.

One ton of ice per day will require 30 tons in a summer month. Ice may be figured as worth $3.00 a ton as an average, which makes the expense $90 for a summer month. The total consumption during a year will not be less than six times that for the summer month and hence the yearly cost would be $540 for refrigeration with ice.

For mechanical refrigeration under good conditions the rate of power consumption will be one and one-half horsepower. This may be taken as equivalent to 1,500 watts. As the motor runs 24 hours a day the total consumption of power in a day is practically 1,500 times 24 or 36,000 watt-hours or 36 kilowatt-hours, which is 36 times 30 or 1,080 kilowatt-hours per month.

If this power is figured at 10 cents a kilowatt-hour the cost would be $108 a month or $648 a year, which makes the cost somewhat greater than for ice. Owing to the nature of the load, however, past experience has shown those central stations where refrigeration plants have been operated from their lines that a charge as low as four cents or less provides a fair rate. Hence if the charge is figured on this basis the cost per year would be practically $260. To this must be added a charge for cooling water which may be taken at $25 per year as an average. This makes the total charge but $285 with a resultant saving of $255. No charge of interest or depreciation has been figured in the above statement.

Contract for Woolen Mill.

Thr Edison Electric Illuminating Company of Boston has closed a big contract with the Bellingham Woolen Company for electric operation; 330 horsepower will be required. The two large steam plants which have been operated by the company for 50 years will be shut down.

Testing Small Power Meters.

When testing meters on small power installations, a test on the machines running idle, or friction load, and a test on the machines loaded is sufficient for this class. In other installations where the load is nearly constant, as for instance where a motor is driving a pump or air compresser, one test on this load is all that is required. In larger installations the tester in charge of the work should use his own judgment as to what load the meter should be tested on and by what method.

Commercial Practice
Management, Rates, New Business

SECURING A LIGHTING CONTRACT IN DENVER.

By R. B. Mateer.

The march of progress, resulting in the demolition of buildings that have served their usefulness, caused the owners of a property situated in Denver and in the heart of the business section to erect a structure of some four stories in height. The lower floor was divided into several modern and up-to-date store-rooms, and learning who were prospective tenants, steps were taken by the Illuminating Department of the Denver Gas & Electric Light Company to provide for the necessary flat-rate feeds for window lighting and to interest the tenants in an effective scheme of interior lighting. In this case some experience in the past caused the representative to be somewhat cautious in his movements and he merely ascertained the correct name and address and the character of business. Reporting such details to the illuminating engineer, several interviews resulted in permission to prepare plans of illumination such as would equal or surpass those in use at other stores of the same nature. Learning the dimensions of the store, the location of various counters, the colors to be used in decorating, and determining the amount of light per candle-foot necessary to be effective, the draftsman of the Illuminating Department prepared a very comprehensive scheme of interior illumination, resulting in the installation of nine 250-watt tungsten lamps equipped with nine E-250-watt Holophane shades. Three of the lamps were installed in the front windows, which are some 25 feet in width. The remaining six were installed on a side window, 50 feet in length. These lamps operate on the flat rate, from dusk until midnight each and every night of the year.

Six and one-half feet from each wall and extending from the front of the store for a distance of some 40 feet are installed two rows of 250-watt tungsten lamps equipped with Holophane shades. Each lamp is supported with a chain pendant and is 12 feet from the adjoining unit. A total of eight 250-watt tungstens are so placed as to give a uniform and effective interior lighting scheme. At the rear of the store is located a small balcony or deck. Three lamps are used below the deck and two above, each equipped with E-60 Holophane shades and 60-watt frosted-bowl tungsten lamps.

As before mentioned, the work of procuring this contract of preparing a scheme of illumination satisfactory to the customer, was largely under the supervision of the Illuminating Department. The actual conversation and the argument used that convinced the customer of the necessity of using window lighting on a flat rate and a plain, yet elegant, scheme of illumination in the interior such as would give a maximum of light and a minimum of cost is not a matter of record, but is merely one of the incidents that have become rather common of late in our efforts to promote the sale of current.

High-Voltage Danger Signals.

With the steadily increasing adoption of higher voltages for transmission lines and with the extension of lighting and power circuits into rural districts, the risk of grounds is becoming more serious and more likely to cause accidents. Particularly is this true in the outlying and rural districts where boys are fond of climbing poles and where men are apt to lean up against them. While a general warning to the public to keep away from all poles carrying light or power wires ought to be sufficient, experience has not proven this to be so, and in case of any accident a local jury is likely to return a heavy verdict against the central-station unless the latter can prove that it has endeavored to warn the injured person of the danger existing at the very spot in question.

Sign of High Voltage.

In Europe, and particularly on the continent, where signs of danger and of caution are often so plentiful as to mar the beauty of the landscape, the warning as to the proximity of dangerously high voltage has taken the form of a standardized symbol, apparently borrowed from the old representations of the forked bolt of lightning wielded by Jupiter. In Germany, this downwardly zigzagging arrow is now commonly used even within the central stations, being placed on the high-voltage instruments and other apparatus to distinguish the same from what is operated at lower voltages. Outside the generating or distributing plants, the characteristic symbol is usually accompanied by a simple legend, as in the adjoining cut of a sign in which the wording has been translated. So common are these now that one maker of enameled signs advertises his carrying in stock signs with the high-voltage symbol and with the different wordings.

Of course, the distinctiveness of this symbol tells its story at a glance and if any accident should occur where such a sign is posted, the lighting company can easily prove its having warned all parties not only as to the general danger but specifically as to the proximity of high-voltage currents. The same reasoning would seem to apply in the case of high-voltage circuits in this country and if the identical symbol were adopted by the electrical fraternity here, it should not take long to educate the general public to its significance. Might it not be well for some of our electrical organizations formally to adopt this same emblem and to urge its use as another step in the general effort to safeguard all who may come near any high-voltage circuits or their supports?

Bringing Business to Johnson City.

The Tennessee Eastern Hydroelectric Company has announced that it will donate free power to new industries in Johnson City, Tenn., for a considerable time. The company is now building a hydroelectric plant at Greeneville and has purchased the plants of the Watauga Electric Company and the Johnson City Traction Company.

Electric Cooking Economies.

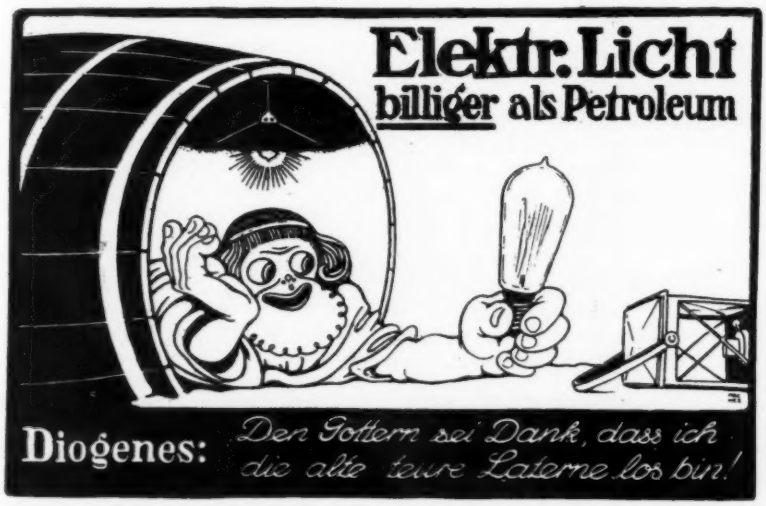
"Recommending an electric range is a very delicate matter," remarked a salesman for electric heating apparatus. "The question immediately comes up, how much current does any particular stove consume; will it be more expensive than gas or coal, and how much more?

"It might seem as if you could give a simple answer to such questions, but that is not the case. The cost of cooking by electricity depends very largely on the cook. Now I myself could oversee the preparation of a meal where the charge for current would be no more than the cost of gas in the same case.

"This is done by remembering that with electric units a large amount of heat is stored up in the discs after the current has been turned off. For instance, in boiling eggs it would be necessary only to bring the water to a boil; then the current could be turned off and the cooking would be completed by the heat accumulated in the unit. This principle applies to all electric cooking, and once the operator has grasped the fact she can cut down the cost of current immensely."

On this account electric ranges can be more strongly recommended to women who do their own work than to homes where ordinary "hired help" is employed in the kitchen. The recent immigrant can hardly be brought to comprehend the storage and radiation of heat, nor has a housework girl the same incentive toward careful usage. Yet again, even when the owner of the range is also the operator, some women develop more easily than others the knack of careful management and seem better able to take advantage of opportunities for current saving. Where the lady of the house herself attends to the cooking, she is far more apt to master the economies possible in electric heating for the sake of its great convenience.—*New York Edison Monthly.*

Electric Light Takes Less Money Than Oil.



Thank the Gods, I Am Through With the Old Lantern.

German Electric-Light Propaganda.

Far from overlooking the importance of educating the general public through the daily press, many of the central stations of Germany have been using special cuts in their newspaper campaigns for added patronage, which campaigns are directed at both oil and gas users. Of the three typical cuts reproduced herewith, one depicts a kerosene lamp devouring coins much more voraciously than its tungsten rival, while another shows the joy of Diogenes at being rid of his old lantern.

The third illustration forms part of a special campaign along a line which seems to have been left almost untouched in this country, viz., the pleading for electric lamps as the only safe lights for use where there are children. The inscription on this oval (which is also used as a gummed label on letters and parcels) would certainly deserve exploiting in the United States also: "Wherever there are children, use only electric light. No explosions, no poisoning, no matches."

The Only Light for Children.

A Company Publication.

In order to increase the interest of stockholders and keep these individuals well informed as to the progress of their interests, the Kentucky Southwestern Electric Railway, Light & Power Company, of Paducah, Ky., is now publishing a monthly magazine telling of its doings and its purposes, as well as running interesting personals and side-lights upon topics of interest. The publication goes to the company's stockholders, materially stimulating interest in a project to build more than 200 miles of electric railway and several central stations for Western Kentucky consumers.

The Harwood Electric Company, of Harwood, Pa., reports a substantial increase in its contracts for power. New connections in August call for more than 1,300 horsepower. The company consequently is making extensive enlargements to its plant, and is installing a new turbine of 6,250-kilowatt capacity.

Electrical Construction

CIRCUITS FOR OPERATING TWO-WIRE DIRECT-CURRENT DYNAMOS ON THREE-WIRE SYSTEM.

Description of a Large Installation.

The cost per pound of conductors for the distribution of electric power is sufficiently large to make it highly desirable always that circuits be designed with a special view to using as little of this material as is consistent with good practice in such matters as securing the necessary mechanical strength and preventing excessive loss of energy in the wires of the circuit. Efforts to secure the greatest possible economy in cost of conductors gave us the now widely used three-wire system of distribution, and the saving which the system makes possible accounts for its popularity.

The exact advantage of this system of distribution becomes apparent upon very slight investigation. Suppose, for example, that we have two incandescent lamps of equal voltages and requiring equal amounts of current, which current we will assume, for the sake of simplicity of calculation, to be two amperes. If these lamps are connected in multiple, the total current in the line when both of them are burning will be four amperes, and if the total resistance of the line supplying them with current be one ohm, say, the loss of power in the line will be 16 watts, since the power lost in a current-carrying conductor is equal to the product obtained by multiplying the current by itself and then multiplying by the resistance. If the two lamps were connected in series across a circuit of twice the voltage of one of them, the current required would be but two amperes. Hence, for the same line loss as before, two wires, the combined resistance of which was four ohms, might be used. Obviously, these wires would be only one-fourth as large in cross-section and therefore only one-fourth as heavy as the wires required in the first case. If the source of power were so arranged as to make it convenient to add a third wire in such a manner as to prevent both lamps from being extinguished when the current was turned off from one of them, the addition of this third wire would give us what would be essentially the well known three-wire circuit. Each one of the two wires installed when the lamps were put in series was one-eighth the weight of the total copper required when the lamps were in multiple; making the third wire equal in size to one of the other two would give us a circuit containing three-eighths as much copper as was contained in the circuit first considered. In general, then, in order to deliver a given amount of power at a specified line loss over a three-wire circuit, but three-eighths as much copper is needed as is required to deliver the same power with the same loss by means of a two-wire circuit.

Perhaps it should be explained here, however, that the foregoing remarks are not meant to be a comparison of three-wire polyphase, alternating-current distribution with two-wire single-phase circuits.

Single-phase alternating-current distribution lends itself very readily to three-wire service, since standard lighting transformers are usually arranged for a connection at the middle point of the secondary winding as well as at the ends of it.

In direct-current work, one of the oldest schemes for three-wire distribution consists in connecting two direct-current generators in series and running the middle wire from the point where the two dynamos are connected together. For lighting small, compactly built towns this arrangement may prove satisfactory. The switchboard can easily be arranged so that one of the two machines can be shut down at times of small load, and the light load carried with the remaining one. In case the load on the plant grows until the demand on the station exceeds its capacity, a third dynamo wound for the sum of the voltages of the other two generators may be added, and operated in multiple with these two running in series. The higher voltage generator, however, must be of a special design. If the low-voltage machines are compound wound, as is usually the case, the third dynamo must be provided with two separate series windings, and there must be two equalizer circuits.

Present practice in direct-current engineering favors the use, however, of either a so-called three-wire generator for supplying current to three-wire circuits or the use of a standard two-wire dynamo operated in conjunction with rotary balancer units. In a widely used type of three-wire direct-current dynamo, the machine is equipped with slip rings, in addition to the commutator. The voltage for the middle or neutral wire is obtained by means of one or more auto-transformers, or choke coils, connected to the slip rings. The middle wire is tapped off from the winding of the choke coil at a point midway between the ends of it, the outside wires being connected to the armature brushes in the usual manner. The inductance of the choke coils prevents alternating current from flowing into the circuit, but when any lack of balance occurs between the two sides of the circuit the necessary direct current passes readily through the coils.

There is also a three-wire generator on the market in which the winding to which the middle wire of the circuit is attached is contained in the armature itself, and thus there is no need for any sort of transformer.

The figures in this article refer to a large installation in which standard two-wire direct-current generators are used, and rotary balancers, or compensators, are employed in order to secure three-wire distribution. In this plant there are three Crocker-Wheeler 230-volt direct-current generators, having an aggregate capacity of 1,200 kilowatts. There are two 115-volt balancers, built by the same company, one of them being rated at 75 amperes and the other at 150 amperes. The plant has just been installed in the new Rand McNally Building, in Chicago, under the direction of Frank H. Getchell, electrical engineer for Holabird and Roche, the architects in charge of the building.

A rotary balancer of the kind under consideration here is a motor-generator, both ends of which are exactly alike in every particular. The negative brush of one end is connected electrically to the positive brush of the other, and from this point connection is made to the middle or neutral wire of the three-wire system. The two remaining leads are carried, respectively, to the positive and the negative busbars. The two shunt fields are connected in series across the two outer wires or busbars. These con-

nections are shown rather clearly in Fig. 1. In this figure the commutators of the two armatures of each balancer unit are represented as being adjacent to each other. It is understood, however, that they are really on opposite ends of the shaft of the unit.

The operation of the balancer set is comparatively simple. In starting the machine, one end of it is thrown across the line, between the neutral and an outer bus, and started up as a motor driving the other end as a dynamo. While the load on the system remains balanced this unit will only take sufficient power from the line to supply its no-load losses. If one side of the system becomes more heavily loaded than the other, however, that end of the balancer connected to the less heavily loaded side runs as a motor, and thus causes the other end of the unit to deliver current to the more heavily loaded side of the three-wire circuit. The operation becomes easily apparent from a study of Fig. 1, in which the two compound-wound balancer sets used in the Rand McNally plant are shown diagramatically. Suppose, for instance, that only the right-hand one of the two sets is running, and assume that the lighting load between the positive and the neutral busbar becomes heavier than the load between the neutral and the negative bus. Under this condition, there will be a flow of positive current from the load back to the neutral bus, which will raise the potential of that bus and establish a flow of current from the neutral busbar through the two series windings *e-d-c*, and into the positive brush of left-hand end of the balancer. Thus this end of the machine will run as a motor and drive the other as a generator to supply the unbalance current to the line.

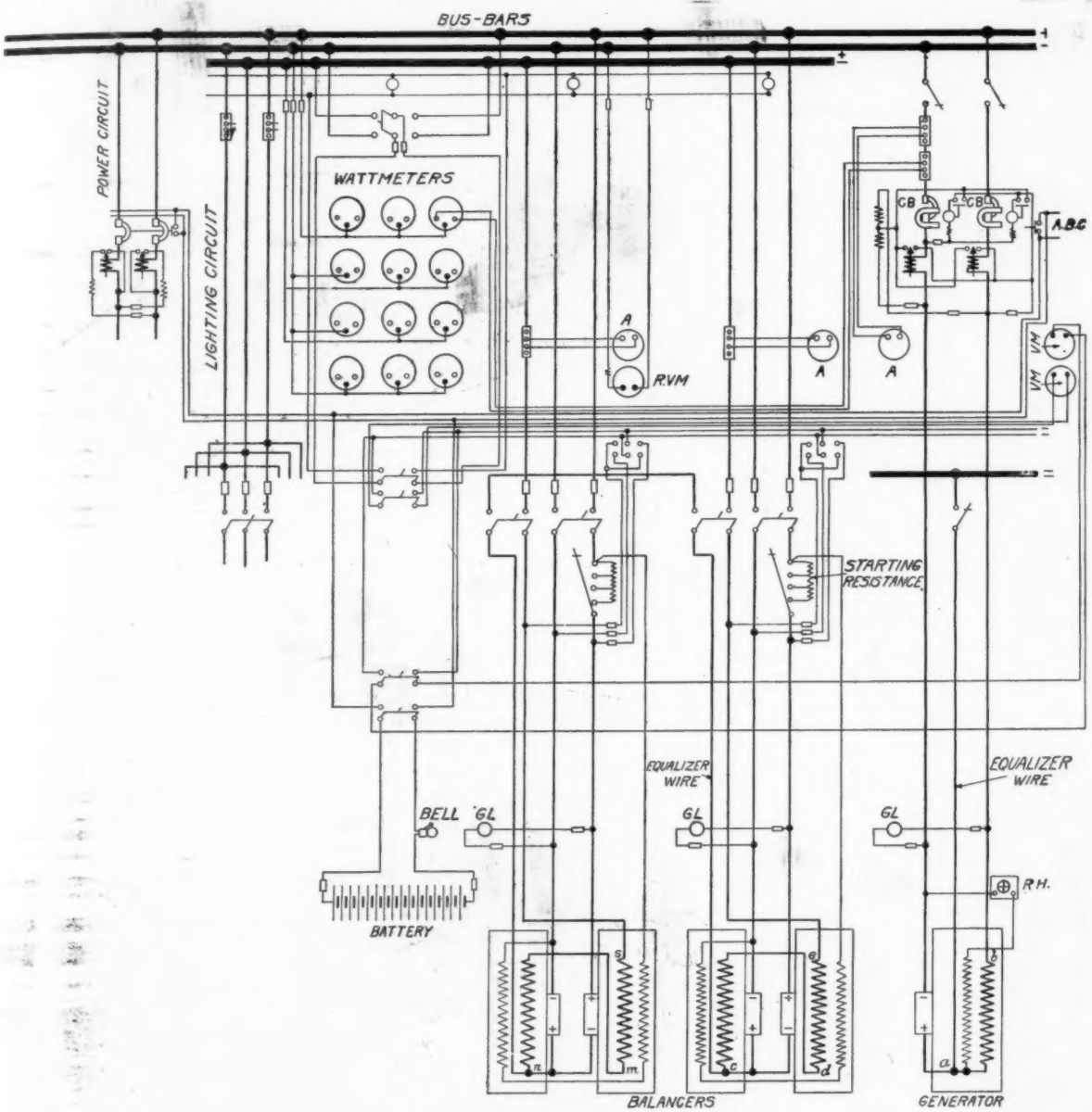


Fig. 1.—Diagram of Connections.

It is easy to see, also, that in case the unbalance occurs on the negative side of the neutral there will be a flow of positive current from the neutral bus into the load, which will lower the potential of this busbar and set up a flow of current from the positive brush of the left-hand end of the balancer in question to the neutral busbar, this end of the balancer being

driven in the meantime by the opposite end of the set.

It should be noted that the current in the series windings of the balancer fields is always in such a direction as to tend to weaken the field of the side running as a motor and to strengthen that of the generator end. This is clear from the fact that the current in the shunt fields has the same direction always, while that through the series windings is in the same direction as the current in the shunt field on one end of the unit and the two currents oppose each other in direction on the opposite end. The condition mentioned tends to raise the voltage of the generator by an increase in its speed and at the same time a strengthening of its field.

As is clear from Fig. 1, the direction of the current in an armature of the balancer unit reverses automatically whenever that end begins to run as a motor. Thus, the direction of the shunt-field current being constant, the direction of rotation of the balancer does not change.

Electricians sometimes find it difficult to get a clear conception of the principle of operation of the equalizer circuits generally employed where two or more compound-wound direct-current generators are run in multiple. In Fig. 1 one of the three generators in the station is indicated in the lower right-hand corner of the diagram, and the equalizer wire for this machine is shown. On the actual switchboard, the equalizer bus—marked at one end with two short horizontal lines in the figure—extends to the right and has two other equalizer wires connected to it, one for each of the dynamos. Each equalizer is connected at the dynamo end of it to the positive brush of the machine it serves, between the commutator and the ends of the field windings nearest the brushes. The connection is shown at *a* in Fig. 1. Suppose, now, that the dynamo indicated in Fig. 1 and one other not shown were running in multiple. It may be assumed for the sake of simplicity that the two generators are exactly alike in every particular. So long as the two divide the load equally there will be no current in the equalizer circuit. Suppose, however, that the voltage on, say, the generator shown in the diagram becomes high and thus causes it to pick up more than its share of the load. Both equalizer wires have the same potential at the equalizer busbar, of course, and it is also clear that the drop of voltage or potential through the series coil of the more heavily loaded machine will be greater than the drop through the other series field, this being due to the fact that the drop in voltage in a wire increases as the strength of the current in it is increased. It follows, then, that under the conditions mentioned the potential of the point *a* in the generator shown in Fig. 1 will be higher than that of the corresponding point on the other dynamo. Hence there will be a flow of current from *a* over the equalizer wire shown, then over the equalizer busbar and the equalizer wire of the lightly loaded machine, and finally to the positive bus of the main load supply through the series winding of the lightly loaded dynamo. Passing through this series field winding, the equalizing current raises the voltage of the dynamo which is not taking its proportionate share of the load, with the result that it begins to pick up more load. The equalizing action continues until the load is properly divided.

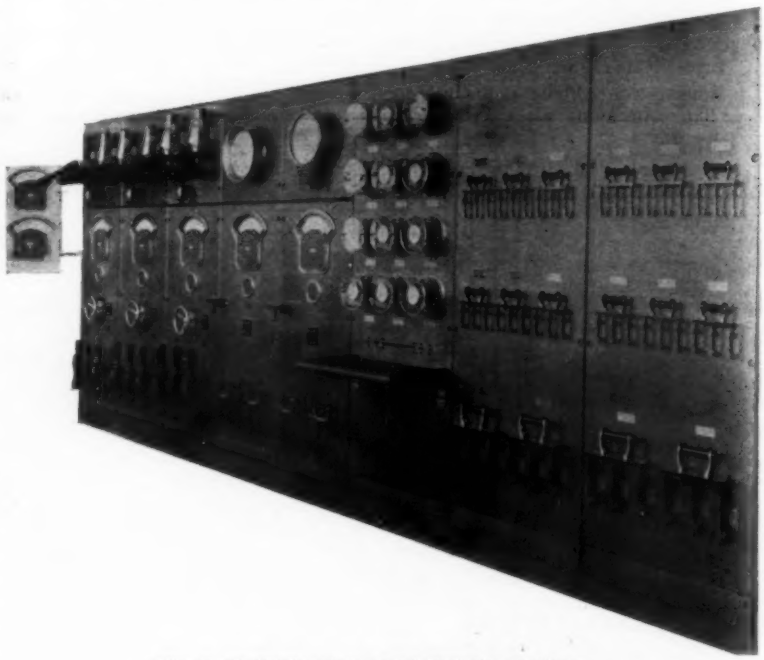


Fig. 2.—Switchboard in Rand McNally Building.

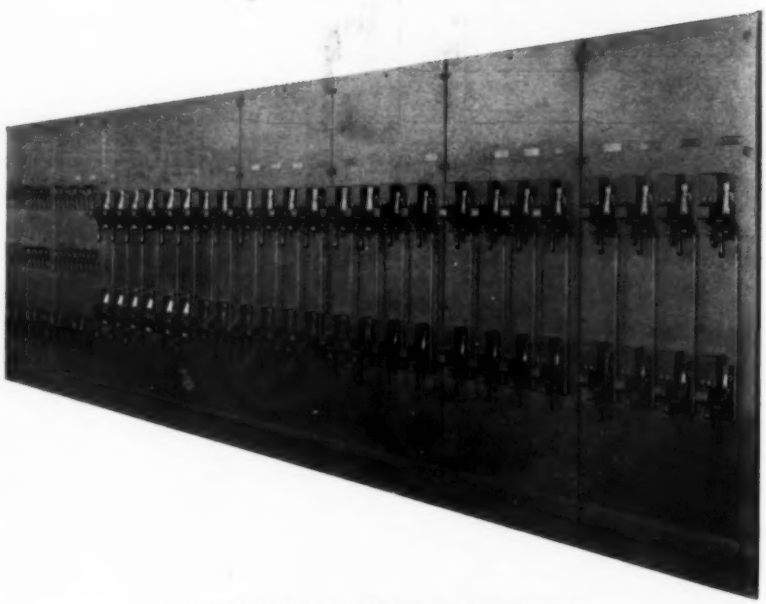


Fig. 3.—Another View of Front of Switchboard.

Proceeding in the same manner as above, it is quite easy to understand the operation of the equalizer circuits on the balancer units in Fig. 1. Assume, for example, that the load

between the neutral and the negative side of the system becomes heavier than that on the other side of the system while the two balancers are running in multiple. The left-hand end of both balancer sets would thus be called upon for dynamo service. If, say, the balancer set on the right should become more heavily loaded than the other one, it is pretty clear that point *c* would be at a higher potential than point *n*. Current would therefore flow from *c* through the equalizer wires to point *n*, and this current would reach the neutral bus through the field windings *n-m-s*, thus raising the voltage of the machine on the left and causing it to take up a greater load.

Figs. 2, 3, 4 and 5 are photographs of the switchboard in the Rand McNally Building. The board was furnished by the Sprague Electric Works and was erected by the White City Electric Company, of Chicago, which firm did all of the electrical construction in the building. As the photographs indicate, this switchboard is a high-class piece of work, both from the standpoint of correct design and from that of good workmanship in manufacture and installation. The total length is 40 feet, and the panels are made of slate. Starting at one end, the first three panels are generator panels; the next two are balancer panels; then there is a panel for recording wattmeters; and finally there are three three-wire panels for lighting circuits and six two-wire panels for power-circuit control. Bracketed to the first generator panel there are two Weston voltmeters, and there is also a Bristol recording voltmeter connected permanently to the outer busbars, this meter being marked *R V M* in Fig. 1. Each one of the dynamo panels has a flush-type Weston ammeter mounted on it, as have also the two balancer panels. The recording voltmeter is mounted near the top of one of the balancer panels, and in line with it on the other one of these two panels is a standard clock. Clock, voltmeters and ammeters are of an unusually neat finish, and those units of them mounted directly on the board have their front surfaces flush with the front of the board. There are Sangamo watt-hour meters for measuring all power used in the operation of elevators, lighting of halls, and for other purposes in connection with the maintenance of the building.

The generator panels are supplied with single-pole knife switches and also with circuit-breakers. The breakers on one generator panel are marked *C B*, near the upper right-hand corner of Fig. 1. There are both time-limit and reverse-current breakers in the circuit here.

The power circuits are all provided with circuit-breakers, and the lighting circuits with three-pole switches and fuses. These fuses are mounted on special slate panels behind the board, as shown in Fig. 5. Some of them are 600-ampere fuses. All breakers are provided with an arrangement for the automatic sounding of an alarm bell when a circuit opens. This bell is operated by the battery shown in Fig. 1. The battery switch is kept closed while the plant is in operation, and the bell circuit is completed as at *A B C* in Fig. 1 by the opening of any breaker.

On each generator and each equalizer panel there is a green lamp which is connected across the terminals of the machine to show the attendant when the machine is being used. These lamps, which are marked *G L* in Fig. 1, are really behind the board and illuminate a sort of bull's eye set in the panel itself. All small wiring behind the board is in rigid conduit, with suitable fittings.

In Fig. 1 but one of the 24 lighting feeders is shown, and only one of the power feeders. The potential circuits, for shifting the voltmeter connections from one circuit to another, have also been omitted. It was thought better not to crowd the figure so much as to make it difficult to trace any of the circuits.

Fig. 4.—Rear View of Three-Wire Switchboard.

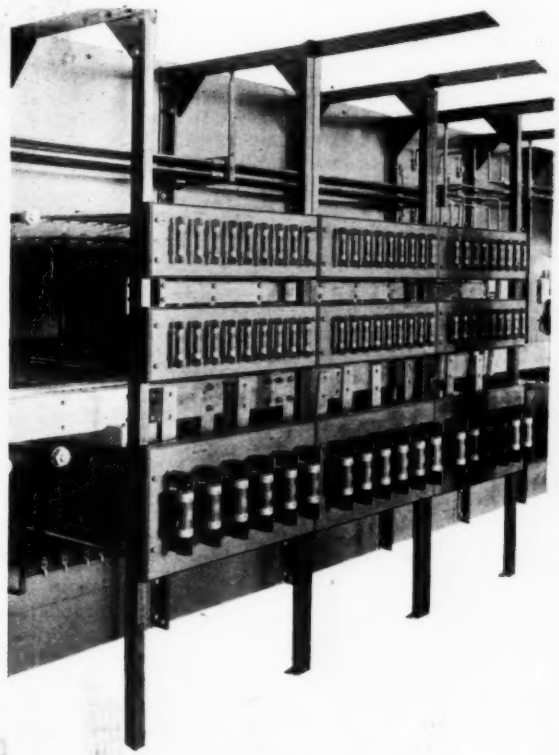


Fig. 5.—Showing Fuses in Rear of Switchboard.

Recommendations for the Installation of Moving- Picture Machines.

A set of rules covering the installation of moving-picture machines has recently been drawn up by M. E. Cheney, electrical engineer for the Washington Surveying and Rating Bureau, of Seattle, which possesses many points of interest to people concerned with the wiring of moving-picture theaters and to those interested in the fire hazard of the moving picture. The rules, which are printed in pamphlet form, give detailed specifications to be followed in the construction of the booth, these specifications being fully illustrated; and there are notes on how the booth should be wired, and a number of very pertinent suggestions as to the exercise of the proper care in the operation of such installations.

It is insisted that arc lamps used as a part of moving-picture machines must be constructed similar to arc lamps designed for use in theaters, and wires to these must not be smaller than No. 6 B. & S. gauge. If house lights are controlled from within the booth, an additional emergency control must be provided near the main exit of the building and kept in good condition at all times.

All wiring within booths must be in conduit. Where wires leave the conduits near machines, suitable condulet fittings must be used. Wires must not be concealed in the walls or the ceiling of a booth.

No cutouts for any purpose whatsoever are allowed within the booth.

One light is allowed for each machine and one for the re-winding bench. These lamps must be provided with suitable wire guards.

All rheostats must be mounted on slate bases outside of the booth, if possible, and properly supported. Said supports must be made of iron and securely fastened to the floor. The rheostat must be securely fastened to slate base.

The entire rheostat is required to be covered by metal with holes for ventilation or a suitably heavy wire screen, to prevent the possibility of any inflammable object coming in contact with heated coils.

Top and bottom reels must be inclosed in steel boxes or magazines, each with an opening of approved construction at bottom or top, so arranged as not to permit the entrance of flame to the magazine. No solder is to be used in the construction of these magazines. The front side of each magazine must consist of a door spring-hinged and swinging horizontally and be provided with a substantial latch.

Reels containing films under examination or in process of rewinding must be inclosed in magazines similar to those required for moving picture machines, or in other approved metal boxes.

Extra films must be kept in a metal box with tightly fitting cover, as previously described.

A shutter must be placed in front of the condenser, arranged so as to be readily closed.

An automatic shutter must be provided and must be so constructed as to shield the film from the beam of light whenever the film is not running at operating speed. The shutter must be permanently attached to the gate frame.

Machines must be operated by hand. Motor driving is not permitted.

The handle or crank used in operating the machines must be secured to a spindle or shaft so that there will be no liability of its coming off and allowing the film to stop in front of the lamp.

A competent operator shall be in charge at all times. Visiting in the operating room during the time a show is in progress is prohibited.

Mill Wiring.

In a paper read at a convention of the International Association of Factory Inspectors recently, Ira G. Hoagland said that where electricity is used the installation of wiring and machinery should be strictly in accordance with the National Electrical Code, and modifications to the original installation should not be allowed any more than you would allow a blacksmith to do a job of plumbing in your house. Not uncommon is it to see the purpose of the no-load release feature of direct-current motor starting rheostats defeated by tying fast the contact arm in running position. And quite a common practice is to replace spent cartridge fuses with bare fuse wire wrapped like string about the fuse terminals. Lighting circuits should be so arranged that the safety fuses and cutout switches are located on side walls in noncombustible cabinets. These devices overhead attached to ceilings are a nuisance. And wiring is safest when it is in conduits. The causes of a great many fires laid to defective insulation, defective wiring and so on, are due to something else, but it is little short of foolish to disregard in the slightest degree any of the provisions in the National Electrical Code in installing electric wiring and apparatus. The use of electricity in factories for heating irons, glue pots, and what not, is quite common and in cases such as these, where the evidence of live circuits is not visible to the eye, small red lights should glow when the current is on.

LETTERS TO THE EDITOR.

Multiple-Series and Series-Multiple.

To the Editor:

In regard to the use of the terms "multiple-series" and "series-multiple," I feel somewhat that where the doctors or dictionaries disagree, it is hardly my province to offer a definition as to the proper meaning of these two terms.

I will say, however, that in reviewing old records where this word first appears in the National Electrical Code, I find that it was used in connection with placing incandescent lamps on the old series arc circuits and that the term "multiple-series" was used. From this it is evident that so far as the Code is concerned, the term "multiple-series" is intended to describe one or more sets of lamps, each set being in multiple, in a series circuit, that is, in a constant-current circuit; and therefore the term "series-multiple" must, of course, have been intended to refer to one or more sets of lamps in series, each set being connected in multiple to a constant-potential circuit.

Personally it seems to me that this is the most natural definition of these terms, that is, that the second word in the compound term refers to the class of circuit in which the translating device was used and therefore that when the second term is "series" it refers to an arrangement in what is known usually as a series circuit, and that when the second term is "multiple" it refers to an arrangement in what is usually known as a multiple circuit.

Further than this, it seems grammatical that the first term of a compound word should be the adjective or modifying word and that therefore where a number of translating devices wired up in multiple were inserted in a series circuit, it was called a "multiple-series" and that where a number of such devices were wired up in series and inserted in a multiple circuit, it was called a "series-multiple."

Whatever may be the final definition of these two words, there is no question that so far as the Underwriters' Rules are concerned, the definitions given above, and which agree with the understanding of Secretary Sweetland, of the Electrical Committee, were the ones in mind when the words were inserted in the rule.

C. M. GODDARD.

Boston, Mass., August 28, 1912.

To the Editor:

I have read the article and editorial regarding the definition of "multiple-series" and "series-multiple." In my opinion it would be unwise to attempt to make a rigid definition. As I un-

derstand it a series system is a system in which there is one source of power and the current flows through all the lamps in series, the same current passing through any one lamp passes through any of the others.

The "series-multiple" or the "multiple-series" system would be a combination, and while it would be possible to say that the first word should indicate which was the prevailing feature it would be just as correct to say that the last word should indicate the prevailing feature, and there would be no more hope of obtaining a universal agreement than there would be of obtaining an international agreement as to whether an adjective should precede or follow the noun to which it applies.

There will always be cases where the multiple feature is just as important as the series feature. There will always be cases where it will depend on which part of the whole system we are considering whether we think that the current first splits up into multiple, or first goes through groups in series, and all that it is practicable to do is to use either "multiple-series" or "series-multiple" to indicate that both features are part of the circuit under consideration.

For instance, take a three-wire system with two or more customers on it, if the main neutral fuse should blow it would then be a "series-multiple" system. If then the neutral fuses blew it would turn it into a "multiple-series" system. In any case the "series-multiple" or "multiple-series" will have to be defined by much more than the words in order to show the exact conditions, so it is hardly worth while to try and reach any definite comparison between "multiple-series" and "series-multiple."

R. S. HALE.

Boston, Mass., August 21, 1912.

To the Editor:

Referring to your editorial in the issue of August 17 on, "What Does Multiple-Series Mean?" I would suggest a somewhat more readily understood definition by saying "multiples in series," or "series in multiples." If on looking over a diagram of connections, it contains a number of multiples which are in turn connected in series, one would express it as a number of multiples in series. While this puts a longer name to it, it does not necessarily follow that it should be expressed as such, but if the word "in" were understood to belong between the two words, it would be a long step in preventing these two terms from getting mixed up. The word "of" could be substituted also, in which case the meaning is reversed from that with the word "in." I believe, however, that a majority of those engaged in electrical work would grasp the meaning more quickly when expressed with "in."

JOS. A. BAEHR.

Minneapolis, Minn., August 29, 1912.

To the Editor:

In the article by Mr. Z. C. Adams upon "Multiple-Series and Series-Multiple Wiring" appearing in your issue of August 17, the author says neither system is approved by the National Electrical Code for lighting purposes. This being the case it appears to me doubtful whether the Standards Committee of the American Institute of Electrical Engineers would deem the matter of sufficient importance to bring it up for consideration. So long as the terms are actually used, however, and wiring on these plans is most suitable for railway lighting installations, there should be no confusion in mere definitions. If the Standards Committee should undertake to determine the proper definitions, this would be the most satisfactory plan for dealing with the matter, as its work is not only generally recognized as authoritative, but its rules are frequently revised, and reprinted, which is not the case with all dictionaries. Those who care to investigate the history of these definitions will find them referred to in a book by William E. Sawyer, "Electric Lighting by Incandescence," published in 1880, and in the second of a series of three "Cantor Lectures," by Professor George Forbes before the Society of Arts, London, early in 1885, on "The Distribution of Electricity." Eighteen years have elapsed since I edited the electrical definitions in the Standard Dictionary and, considering the growth of the art during that period, the work cannot be considered up to date.

The suggestion of Mr. Adams appears to be a good one, and if generally approved, might be introduced through the medium of handbooks, textbooks and the technical press, and would no doubt eventually be accepted by the dictionaries.

RALPH W. POPE.
Honorary Secretary, American Institute of Electrical Engineers.

Ocean Grove, N. J., September 2, 1912.

Among the Contractors.

The Spengler Electric Construction Company of Port Jervis, N. Y., has secured the contract for the electrical work on the First National Bank Building, which is a new $50,000 structure.

The Independent Electric Company, 1431 D Street, San Diego, Cal., has been formed by F. L. Edwards and G. E. Kirkpatrick. Both of these men were formerly associated with the Johnstone Electrical Company, which has been purchased by the new concern. The capacity of the factory and salesrooms will be doubled at once in order to keep pace with the business arising from the tremendous growth of the city of San Diego, which has received such an impetus from the prospective exposition in 1915.

Childers & Walters, well known contractors of Louisville, Ky., are engaged in rewiring and equipping the Kentucky State Fair Grounds in Louisville for electric lighting. Thirty 500-watt tungsten lamps are being installed in the grandstand at the Fair Grounds, which has been enlarged for the 1912 exposition, which is to commence September 9. Sixty 500-watt tungstens are being installed in the new pavilions provided for the display of poultry, swine and horses, and 100 100-watt tungstens are being placed about the grounds.

The Marine Electric Company, a prominent electrical contracting concern of Louisville, Ky., has lined up a number of jobs which constitute fine business. Several pieces of work handled by the company are located out of town, evidencing its aggressiveness in going after contracts. The Marine Electric Company is placing 5,000 feet of conduits, with up-to-date wiring, in the distilleries of the Bernheim Distilling Company in Louisville. The Holy Name Roman Catholic Church, at Third and O Streets, is being equipped with conduit wiring and art fixtures specially made by the Marine Company. The Company recently sold 8 electric motors to the Saints Mary & Elizabeth Hospital for general hospital use. The plant of the Brown Printing Company, of Montgomery, Ala., is being wired with conduit, and the Louisville & Nashville Railroad Station at Flomaton, Ala., is also being wired and equipped with a 16-kilowatt generator.

Olson & Oefstos have recently opened a store at 23 Sixth Street, South Moorhead, Minn., where they will carry on an electrical-contracting business and handle a line of fixtures and supplies.

The Mielke Electric Company has recently established a general electrical repair shop for the repair of electrical apparatus of all kinds at 314-316 West First Street, Duluth, Minn. Mr. Mielke, the manager of the company, has had a broad experience in this class of work and with a well equipped shop is in position to take care of all electrical repair work in a prompt and efficient manner.

Dollar Wiring Kinks.

Every reader is invited to contribute to this column. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; and if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

Fishing Wires in Fixture Arms.

Electric fixtures sometimes have arms that are peculiarly and irregularly shaped, and which, therefore, may be rather difficult to wire. I have found the following scheme a good one to resort to in wiring fixtures of this kind.

Take the chain from a pull-chain socket and fasten a strong cord to it. The chain will follow, without difficulty, almost any shape of passage which may be encountered in fixture wiring. A right-angle bend can easily be passed by shaking the arm until the chain draws the cord through.

Charles L. Kehl.

Plugging Up Gas Outlets.

It very often happens that gas fixtures are removed and electric fixtures installed in place of them. In a case

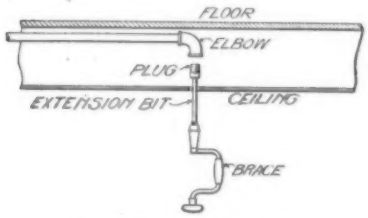


Fig. 1.—Plugging a Gas Outlet.

of this sort the gas pipe should always be effectively plugged at the outlet. A simple way of plugging the gas pipe is as follows. When the drop has been removed, place the plug in an extension bit holder and proceed to attach it to the open end of the gas pipe. A few turns of a brace will screw the plug firmly into the tee or ell.

Charles A. Bergen.

Locating Grounds in Conduit Circuits.

Electricians sometimes find it difficult to locate the fault when trouble develops in the circuits of a house wired with conduit, or, for that matter, a house wired with any other kind of concealed wiring. I find that the best way to overcome the difficulty is to go to the cutout cabinet and screw a lamp into the fuse base where the fuse is blown, first taking the remaining fuse out. If it is a ground on the circuit the lamp may burn with the fuse out on one side. For a short circuit, however, it will burn only after the fuse has been put back in place. By trying out the various wires successively in this way the trouble can be easily located, as a rule.

A. J. Hanover.

Why Not Use Standard Control?

The accompanying illustration shows a very economical way of controlling a stairway light when it is desired to make it possible to turn the light on or off either at the lamp itself or at the foot of the stairs.

A piece of strong fish line is run through small screw eyes attached to the under side of the railing, as shown

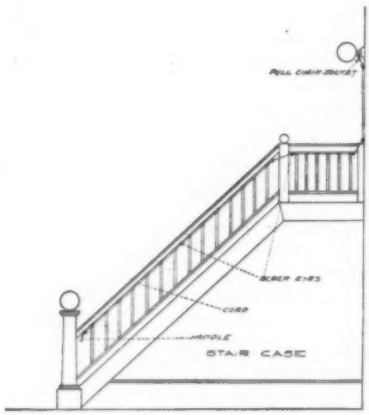


Fig. 2.—Control for Stair Lamp.

in the figure. The lamp itself is installed in a pull-chain receptacle and the upper end of the cord is tied to the chain. It is clear enough that the lamp can be turned on or off from the foot of the stairs by pulling the other end of the string.

Oscar Keck.

A Good Way to Cut Porcelain Tubes.

It sometimes happens that the electrician needs a porcelain tube of a length which he doesn't happen to have on hand, and which, it may be, he cannot readily procure. When I have this sort of difficulty, I get around it by taking a longer tube and cutting or breaking it to the desired length. I heat the part where the tube is to be broken with a torch or over a gas jet, making certain that the porcelain is thoroughly heated at this point. Then I take a piece of wet twine and wrap it once around the tube where the flame was applied. A slight blow or a little pressure will then cause the tube to break at the right place.

Joseph De Angelo.

Another Way of Cutting Porcelain Tubes.

Not long ago I needed a porcelain bushing two inches long for a 4/0 cable. I obtained this by cutting a piece of the desired length from a long porcelain tube, and I did the cutting with a 10-inch power emery grinder. I cut a groove all around the tube by holding it on the edge of the emery wheel, and when the groove had become sufficiently deep I found that the tube could be broken off easily enough. I then ground the end of the bushing off square. The entire job did not consume much more than a minute of time. I consider this the best of all methods for cutting porcelain tubes.

W. H. Milligan.

A Convenient Tool for Bending Conduit.

Fig. 3 illustrates a quick and easy way to make an open hickey for bending iron conduits. As many electricians know, it is common practice to make a conduit bender by screwing a gas pipe tee to one end of a piece of straight gas pipe three or four feet long. In making the bend, the tee is slipped over the conduit and the straight piece of gas pipe is used as a lever in applying the necessary force. If a tool of this sort it to be used, much time can be saved by cutting a slot in the gas-pipe tee along the lines *a b* and *c d* in the figure. This

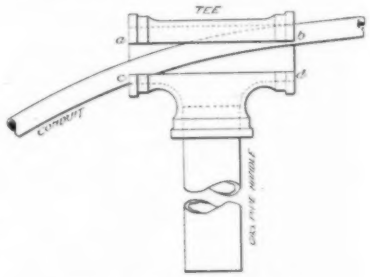


Fig. 3.—Bending Conduit.

slot should be wide enough to enable the conduit to be slipped through it readily, sideways.

The use of this kind of a hickey not only saves time in bending small conduit, but the hickey can also be used in places where is would be impossible to get a solid-tee hickey over the conduit. This tool may prove exceedingly convenient where one is not fortunate enough to have a well known Lakin hickey at hand.

F. Sproul.

The output of copper from the Central States in 1911 came from the States of Michigan and Missouri and amounted to 220,480,513 pounds. Of this production 219,840,201 pounds came from Michigan.

Public Service Commissions

WISCONSIN.

The Wisconsin Railroad Commission has issued a joint decision disposing of the entire calendar of cases which have been pending against the Milwaukee Electric Railway & Light Company and the Milwaukee, Heat, Light & Traction Company, most of which have been under investigation for about three years.

In the application of the city of Milwaukee for a reduction in the city fare, it was held that the present practice of selling 25 tickets for one dollar should be discontinued and in lieu thereof the practice of the sale of 13 tickets for fifty cents should be established. No change was ordered in the cash fare, but the single-fare limits were extended in certain cases, with the usual transfer privileges. The petition of the city for a universal double transfer was denied on the grounds that it was unnecessary and that the peculiar geographical situation of the city makes it impracticable.

In the Deakin case, applying for a reduction in the rate of fare between the cities of Milwaukee and Waukesha, the Commission found that the rate of return upon the tangible property had not exceeded 3.35 per cent during the past four years and that therefore no reduction could be considered.

The applications for the extension of single-fare limits to the suburbs of West Allis, Wauwatosa and East Milwaukee were granted.

The Commission also affirmed the recommendations of the Industrial Commission for an improvement in the working conditions of the motormen and conductors employed by Milwaukee Electric Railway & Light Company. The recommendations provide for an increase in the number of days off, and a maximum platform duty of ten hours daily, with no decrease in wages.

A subsequent order is to be issued relating to the improvement of service which, it is understood, will involve about 250 additional car-miles per day and will entail about $22,143 additional expenditure annually.

The Milwaukee Electric Railway & Light Company's property comprises about 14 power plants and substations, nearly 600 cars and about 350 miles of single track. The determination of the value of the railway property used and useful for the convenience of the public was an exceedingly difficult task. The final value determined upon by the Commission was $10,300,000 on January 1, 1910. The company claimed a valuation of $20,546,930 on January 1, 1907, as a value upon which a fair return should be earned. An allowance of $500,000 was made by the Commission for working capital, and of not to exceed $500,000 for going value. The cost of reproduction new was given as $9,942,125 and the present value, $7,378,950. In the case of the Milwaukee Heat, Light and Traction Company, the cost of reproduction was taken as $6,133,000 and the present value, $5,110,211. It was found that the cost of the business, as represented by its deficits from operation during the development period, amounted to about $631,000. The cost of reproduction new was held to represent the total value upon which the company is entitled to earn a return.

The surplus of the Milwaukee Electric Railway and Light Company which was available for return upon the investment in 1911 was found to be $1,436,847. Several facts, other than the reduction in city fares, were taken into consideration by the Commission in disposing of this surplus. It was noted that the recommendations of the Industrial Commission would have entailed an additional yearly expenditure of about $62,443, if effective during the year 1911. The improvements in service which the Commission will subsequently order will amount to approximately $22,000 annually. The losses in revenue sustained by reason of the extension of the single-fare limits to the suburbs mentioned in the order would have amounted to about $131,883 during 1911 and it was noted that this amount would be increased in the future owing to the increased number of long-haul passengers. The decision also called attention to the fact that the burdens imposed by the municipality during the past two years have had an important bearing upon the city's application for reduced fares. As a result of the paving suit recently decided in favor of the city, the company will be required to expend from $150,000 to $250,000 annually as interest and depreciation of the pavement between its tracks, and additional municipal requirements will call for about $40,000 more per year. In connection with the probable future expenditures, the Commission states that a preliminary investigation of electrolysis conditions in Milwaukee has shown that considerable damage is taking place and that steps must shortly be taken to minimize the trouble. Just what further investment and increase in operating costs will be involved, the Commission is not in position to state until after it has completed the more exhaustive investigation which it proposes to undertake. The reduction in city fares will involve a reduction of about $172,000 per year. Taking all facts into consideration, the Commission found that a reduction in fares has only been made possible in the last year of operation.

In its determinations, the Commission limited the rate of return to 7.5 per cent. An allowance for interest of from 5 to 6 per cent was held to be not unreasonably low to compensate for the cost of securing capital and an allowance of from 1.5 to 2 per cent was regarded as sufficient to cover such risks as are inherent in the business. The company's present bonded indebtedness consists of two issues, one bearing interest at 5 per cent and the other at 4.5 per cent.

The company's proposed plan of establishing a system of suburban one-mile zones, with the city traffic restricted to a large 3.5-mile central zone was not approved. Computations showed that the present fare within a 3.5 or 4-mile zone is excessive, even when allowance is made for increase in wages, improvement in service and municipal requirements. It was held that a small central zone would restrict the movement of population from the congested districts of the city, to the detriment of both the health and welfare of the people of Milwaukee. A study of the development of the company's business since 1897 showed that the outlying districts had contributed but a small share toward the 273 per cent increase in traffic and that consequently some consideration should be given the question of encouraging a more rapid development of the suburban territory. It is expected that the extension of the single-fare limits to those suburbs provided for in the order will do much toward accomplishing the desired result.

A feature of the Commission's investigation is the very extended and complete analysis which has been made of the length of paying haul per revenue passenger. Three methods were used, namely, the Bradley method, used by the Stone and Webster Corporation; the method of Frank R. Ford as outlined in the report of the committee of the American Electric Railway Association; and the Commission's method in which fixed and variable expenses are recognized and used in a manner analagous to their use in lighting-rate determination. The last method was used by the Commission in its findings and was applied to individual lines and not to the system as a whole.

All orders involved in this decision are to go into effect on September 23.

MASSACHUSETTS.

The Massachusetts Railway Commission has recommended that the Worcester Consolidated Street Railway issue workingmen's tickets, good during certain hours, between City Hall, Worcester, and Cherry Valley, for a five-cent fare. A similar recommendation has been made regarding the Bay State Railway Company between West Newbury and Haverhill.

CALIFORNIA.

The Railroad Commission has dismissed the application of the Imperial Telephone Company to increase rates. It has ordered a reduction of rates on the Los Angeles & San Diego Beach Railway.

Permission has been granted to the Indian Valley Electric Light & Power Company to issue notes amounting to $65,228 and to the Northern California Power Company to issue $500,000 of six-per-cent notes, on condition that it files a stipulation to assess within 18 months if so directed by the Commission.

NEW YORK.

The Public Service Commission for the First District has received from the Third Avenue Railway Company a petition asking the consent of the Commission for the purchase by the company of 13,560 shares of the stock and $259,000, par value, of the bonds of the New York City Interborough Railway Company for the sum of $234,625. The petition sets forth that the Third Avenue Railway Company now owns 28,650 shares of the stock and $1,413,000, par value, of the bonds of the New York City Interborough Railway Company, and now desires to purchase additional stock and bonds in the amount stated. The New York City Interborough Railway Company has outstanding $5,000,000 in capital stock and has an authorized bond issue of $5,000,000, of which $3,000,000 have been issued.

Electric Signs in Kansas City.

Like many of the other smaller cities of the country, Kansas City, Mo., has been speedily progressing in the matter of the installation of electric signs, several of which are illustrated herewith through the courtesy of Henry A. Stewart, manager of the local office of the Federal Sign System (Electric).

Fig. 1 represents the sign hanging on the front of the building occupied by the Household Fair, a department store at 1012 Walnut Street. This sign is of porcelain-steel construction and has the lettering flush with the face of the sign, as trough letters are used.

Fig. 1.—Household Fair.

A spectacular feature is the representation of a flame at the top of the sign. This flame comes from a torch, which is illuminated immediately following the lighting of the top section of the line of lights at the edge of the sign, and gives a sky-rocket effect. The lamps in the torch are clear ruby, amber and frosted, to give the effect of fire. The torch contains 140 two-candlepower, 110-volt lamps. The letters of the sign contain 240 five-watt, 11--volt tungsten lamps wired in multiple-series. On the outer edge of the sign are 96 two-candlepower carbon lamps extending from the base

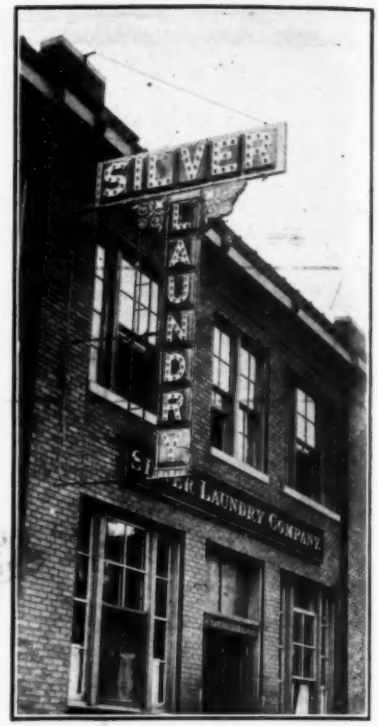


Fig. 2.—Silver Laundry.

of the sign to the torch at the top. This gives a rising streak of light, which is controlled by four switch blades. The torch is flashed off and on after each complete operation of the sign.

The Silver Laundry on Campbell Street is the largest laundry in Kansas City and carries a sign illustrated in Fig. 2. This is a vertical sectional-letter sign reading "Laundry" with the name "Silver" in horizontal letters at the top. The construction is of porcelain-steel. The letters in the word Silver are 16 inches high, those in the word Laundry, 12 inches high. There are 206 two-candlepower, 110-volt lamps wired in multiple. This sign reads on two sides separately and is connected to a two-switch flasher, which flashes the two sides alternately.

The sign advertising Diamond Tires, shown in Fig. 3, is set at the top of a third-story building at Thirteenth Street and Grand Avenue. This sign flashes the three lines in succession,

Fig. 3.—Diamond Tires.

first the word "Diamond," then "Tires Lead," and finally "Users Know." The part reading "Diamond" is of special flat porcelain-enameled steel construction and the remainder of the sign is made of the sectional porcelain-steel letters. This sign has 286 two-candlepower, 55-volt lamps wired in multiple-series on a three-wire, 220-volt supply service.

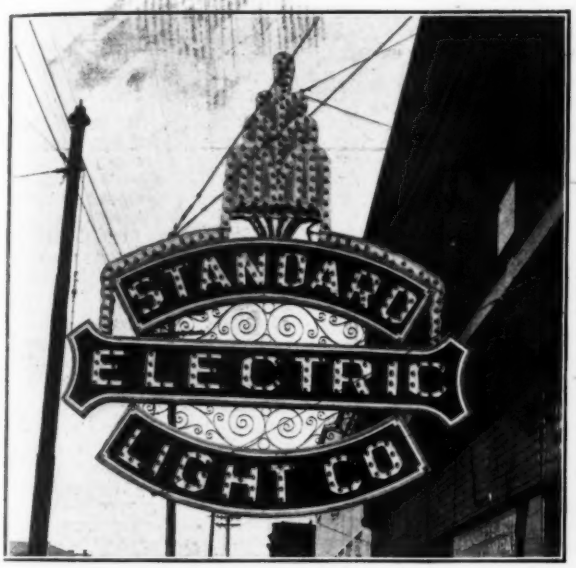


Fig. 4.—Sign of Standard Electric Light Company.

Fig. 5.—Same Sign at Night.

The Standard Electric Light Company has a sign hanging in front of the second story of its building at 715 Minnesota Avenue. This is shown by day and by night in Figs. 4 and 5. This sign is 14 feet long and 17 feet high and is of galvanized-iron construction. At the top this sign represents a fountain which plays continuously, the water appearing to run up in the center and then flow down on each side in continuous streams.

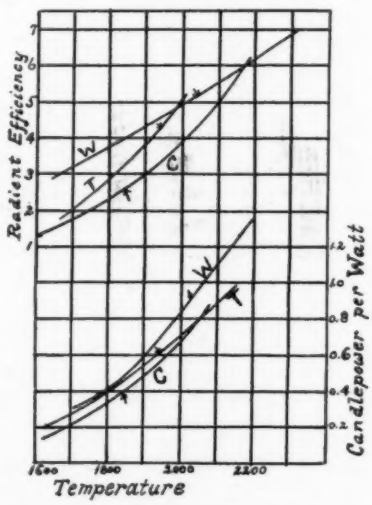
The base of the fountain has 60 two-candlepower, 110-volt carbon lamps of green glass, and this is lighted continuously. The fountain proper has 250 frosted two-candlepower lamps on a high-speed flasher. The reading matter of this sign is wired in multiple-series and uses 385 five-watt, 12-volt tungsten lamps. This part of the sign is controlled by three double-pole switches on the flasher, which lights the three lines in succession.

Consolidation of Japanese Electric Companies.

The three electric light enterprises of Tokyo, the Japanese capital, the Tokyo Electric Light Company, the Municipal Electric Light Company, and the Nippon Electric Light Company are to be united and the supply of power will be obtained from the Katsura River.

Radiant Efficiency of Incandescent Lamps.

A paper was presented by W. E. Forsythe before the American Physical Society in 1910 and reported in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, December 3 of that year, describing measurements upon the temperature and radiant efficiency of different kinds of filaments. This research has since been completed and published in the *Physical Review,* from which the following is taken. As the final results differ from those previously given in the curves published in 1910, attention is called to the final values here given.



Curves of Radiant Efficiency.

The radiant efficiency is here taken to mean the ratio of the energy in the visible portion of the spectrum to the total energy radiated by the filaments. The total radiation was measured by bringing out two beams of light from the source, dispersing one of them and setting a screen so as to cut off all radiation of wave-length greater than the spectrum line A. The remainder was then recombined and balanced photometrically against the total radiation of the other beam. The photometer was then replaced by a thermopile and the radiation of the two beams separately measured. The temperatures were determined by means of a Holborn-Kurlbaum optical pyrometer. Curves are given herewith showing the percentage efficiency for carbon, tantalum and tungsten filaments at various temperatures, the point of normal operation being indicated upon the curves by arrowheads.

Measurements of the candlepower per watt were also made at various temperatures and these are also given in the figure by a second set of curves. The black-body temperatures determined directly by the pyrometer have been corrected, and the values plotted in the curves are true temperatures.

It will be noticed that the curves for candlepower per watt have courses almost parallel. The curves for tungsten give the highest values, with tantalum next and carbon lowest. That is, even if operated at the same temperatures the efficiencies would lie in that order. In addition to this result of selective emission, the metal filaments have the further advantage of operation at a higher temperature, especially in the case of tungsten, and it is particularly due to this fact that so much better efficiency is obtained with metallic filaments than with carbon filaments.

The Outlook.

Some Opinions from Prominent Electrical Men in Every Part of the Country.

To sum it up in the beginning, and get one started right: The outlook is good. It is very good. And there does not appear to be any particular part of the country especially favored. From every direction come reports of improving conditions. Optimism and enthusiasm are the orders of the day. Throughout the Southwest there is a quickening that has not been witnessed in many a day. In the Pittsburgh district labor is short, in fact, this is a condition that will prevail in many quarters before the holidays.

While there has been a healthy growth in the electrical industry during the past three years, it is expected that the near future will witness a considerably augmented business. The greater activity of the larger manufacturers of electrical apparatus in promoting educational campaigns on a national basis is stimulating the demand for more and better equipment. The economies and hygienic advantages of motor drive and electrical illumination in industrial operations of every description are being better understood. Consequently the equipment of factories and workshops will continue at an accelerating rate. The centralization of electrical supply, and the bringing under a co-ordinated control many small plants, undoubtedly works a temporary hardship upon the jobber in the loss of small, profitable accounts. The big operating companies, however, are able to greatly increase the network of distribution, and this brings the day nearer when there will be a universal utilization of electrical material.

Allowing all reasonable discount for the wish being the father of the thought, the next few months would appear to offer a fine opportunity for the most vigorous selling effort upon the part of manufacturers of electrical apparatus. With a considerable increase of available cash resources due to the good prices being offered for abundant crops, the settlement of old accounts should be pushed. Likewise, campaigns for introducing to the public notice current-consuming devices of every description should be undertaken, before the lure of the attractive holiday offerings make too strong an impression upon the buying power of the ultimate consumer.

During the past month a number of prominent manufacturers and electrical supply jobbers were asked to express an opinion regarding the outlook for business. This opinion is based upon inquiries in hand, and the reports of selling organizations in every part of the country. It is with profound pleasure that we are able to present such am imposing indication of faith and promise. The following paragraphs are well worth the careful attention and entire confidence of our readers.

Primary Conditions for a Boom Never Better.

THE ADAMS-BAGNALL ELECTRIC COMPANY, CLEVELAND, O.

Replying to your favor of August 15, will state that to my knowledge the primary conditions in the country for a business boom were never better, and from all indications, as we see them, we are on the verge of two or three years of the most prosperous business we have had since 1904.

From the inquiries which we are receiving from industrial plants, we are led to believe that the majority of them are now working overtime.

I cannot help but think of the words of the old Northwestern philosopher, who says that "no man can afford to be a bear on the resources of this country."

J. G. Pomeroy,
Sales Manager.

Unusually Large Volume of Inquiries in Hand.

ALLIS-CHALMERS COMPANY, MILWAUKEE, WIS.

In reply to your inquiry of August 14, I would say that the outlook for fall business in electrical machinery, judging from the unusually large volume of inquiries in hand, is very encouraging. In every important line of industry there seems to be urgent demand either for more power or greater economy in its application—in either case requiring new equipment; while public service corporations, municipalities and other governmental boards are also in the market for much additional machinery and auxiliary apparatus. Particularly significant is the fact that central stations, generally, are finding their facilities inadequate to the increase of current consumption and will be obliged to make enlargements, with corresponding sales to their customers by manufacturers and dealers of motors, transformers, controllers and other appliances for power, lighting and heating.

In respect to the extension of central-station business, I believe that the campaign of education being carried on by the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN is exerting an important influence, particularly by the printing of exact information concerning the power required in numerous industrial applications and suggestions for promoting the use of electrical current. This inures to the benefit of the entire trade and I hope will be vigorously continued.

C. A. Tupper.

Fall and Winter Trade Will Be Exceptionally Heavy.

BENJAMIN ELECTRIC MANUFACTURING COMPANY, CHICAGO.

The outlook for business in the electrical industry is in my opinion very bright. Judging from our own business and that of others with whom we are in close touch, conditions have been improving for some time, and I feel assured that the fall and winter trade will be exceptionally heavy.

W. D. Steele.

100,000,000 Bushels of Wheat in Kansas.

THE B-R ELECTRIC & TELEPHONE MANUFACTURING COMPANY, KANSAS CITY, MO.

Business conditions are undoubtedly improving in this southwest territory, due to the excellent condition of our crops. Kansas alone harvested 100,000,000 bushels of wheat, and this is coming into the Kansas City market now at the rate of five hundred thousand to a million bushels per day. The corn acreage in Kansas and Oklahoma will be very large and average up with the crops for several years past.

Business conditions, in my opinion, for the first seven months of this year have not been up to the standard for the same period last year. There has been a very large electrical development during the past five years in Kansas and Oklahoma. There are towns of 800 to 1,000 population installing plants, and in Oklahoma, due to speculation and poor crops, they have been unable to take care of their obligations and a number of municipalities have defaulted on their bond interest. For this reason there has been a very poor market for Oklahoma bonds, which has curtailed development and this we have felt in the electrical business. The crops harvested this year in Oklahoma will enable them to pay up their debts, so while we do not expect a great deal of business in that section during this fall, we look for good business in 1913.

We expect an improvement in conditions in Kansas and Nebraska this fall. In my opinion the coming election will not be a factor in regulating business conditions in this section. With our enormous crops and the banks with heavy reserves this section will be able to take care of itself with no regard to the East. Therefore, we expect quite an improvement in our line during this fall and winter and all of next year.

The greatest menace, in my opinion, to the electrical jobber is the syndicating of electric light plants. This is going on at a pretty good clip in this section and when they are taken into the fold the jobber usually loses a desirable customer.

M. BERNARDIN, President.

Conditions Foreshadow a Better Price Situation.

THE CUTLER-HAMMER MANUFACTURING COMPANY, MILWAUKEE, WIS.

Referring to your letter of the 15th, I personally am distinctly an optimist on the business situation. Insofar as I have been able to get in touch with the general situation, there is but one uncertain factor; namely, a certain amount of dullness in staple retail trade. This would appear to be accounted for, at least in part, by the more or less unseasonable conditions which have been prevalent throughout the country.

Insofar as conditions in the metal trades are concerned, however, all reports that I have received indicate brisk business and promise of continuance, for at least the immediate future. I do not believe that present conditions are merely a temporary outburst, as I believe that conditions have been steadily improving since the early part of 1911, and, in fact, believed at that time that I could see a change in conditions. At the present, therefore, I am in the position of saying "I told you so."

So far as our own business is concerned, it is exceedingly active, and the problem is more one of obtaining material and meeting deliveries than of being able to keep the shop busy. These conditions must foreshadow a better price situation. The only trouble with the business of 1911, to my mind, was that it was distinctively a buyers' market, and material was being sold on too close a margin. I believe that improvement has already taken place along this line, and that further improvement can be looked for.

I am inclined to feel that the political situation is of less moment this year than ever before.

A. W. Berresford,
General Manager.

Business Shows a Very Satisfactory Increase.

THE ELECTRIC STORAGE BATTERY COMPANY, PHILADELPHIA, PA.

Our business so far this year shows a very satisfactory increase over the corresponding period of last year, and last year was one of the biggest years in our history. We felt early in the year that the coming presidential election might tend to restrict expansion, but such has not been the case, so far as we are concerned, and while it is natural to expect a temporary slowing up between now and November, we believe it will be very short lived.

The American public has apparently become hardened to political business disturbances, real or threatened, and appears to have made up its mind to take advantage of the bright crop prospects, and to do business in spite of these threatened disturbances.

Charles S. Blizard,
Third Vice-President.

Are Optimistic as Regards Business for Balance of Year.

THE F. BISSELL COMPANY, TOLEDO, O.

In answer to your inquiry, are glad to advise that business with us is good, and with orders already on hand contracted for future delivery, together with inquiries received, based on early requirements, and indicating large investment in all parts of the country, are optimistic as regards business for the balance of the year 1912.

The same holds true as regards our manufacturing business covering cleaners, sewing-machine motors, iron boxes, pine and fir cross arms, locust pins, etc. We are loaded up and there seems to be no abatement in the demand, all of which would indicate a satisfactory condition of affairs in different electrical fields.

W. S. Bissell, Sales Manager.

Look for a Greater Volume of Business.

HABIRSHAW WIRE COMPANY, YONKERS, N. Y.

From the writer's personal observation there is no reason why the volume of business among the electrical industry should not be large, for the reason that wire is selling at a very low cost and the various concerns are placing large orders.

As far as we are concerned, we are very busy, and still look forward to a greater volume of business. Of course, competition is keen which means that prices are low, but raw materials are advancing gradually and I believe there is a tendency that prices will be a little better soon.

J. B. Olson, Secretary.

Outlook Has Never Been Better.

H. W. JOHNS-MANVILLE COMPANY, NEW YORK.

I am pleased to inform you that the outlook for business this fall in our line has never been brighter. Our sales are ahead of last year and we fully expect to enjoy a very prosperous fall business.

J. W. Perry,
General Manager Electric Department.

Outlook Exceptionally Good.

NATIONAL CARBON COMPANY, CLEVELAND, O.

Answering yours of the 14th, I think the outlook for business in the electrical industry the next two or three months is exceptionally good. As a matter of fact, the year 1912 is far better than most people anticipated the beginning of this year. We have no cause for complaint and I do not know of any electrical lines which have not met with fairly good business this year.

N. C. Cotabish.
Sales Manager.

More Than Optimistic.

PASS & SEYMOUR, INCORPORATED, SOLVAY, N. Y.

We are glad to advise you that we are running our factory overtime and believe that the fall business is going to be of such a character that we will be offered more business than we can possibly handle.

We are more than optimistic for the electrical business and are making every effort to place ourselves in a position to handle our share of the increased business.

John W. Brooks, Secretary.

Business Outlook Very Promising.

STANDARD UNDERGROUND CABLE COMPANY, PITTSBURGH, PA.

Replying to yours of the 14th, I beg to say that we find that business is improving very materially in practically all directions, and I consider the present business outlook in the electrical industry as very promising.

J. W. Marsh, President.

Business Good and Conditions Most Encouraging.

TOWER-BINFORD ELECTRIC & MANUFACTURING CO., RICHMOND, VA.

It is surprising, but none the less gratifying to find the business pulse so strong, when we have been educated to believe that if politics is good, business must necessarily be poor; no one can successfully question the flourishing state of politics at this time, but so far as our observation goes the business interests have not suffered.

We have talked with a number of men of affairs whose business lies mainly south of the Mason and Dixon line (now eradicated) and without exception, all report business good and conditions most encouraging.

Getting down to the particular business in which we are most interested, it is a fact that the South is rapidly coming into its own; the numerous water-power developments are giving the people cheap power and plenty of it and the people are not slow to avail themselves of the many economies and conveniences that are effected by the use of electricity in the factory, office and home.

We may be mistaken but we anticipate a steady and increasing demand for electrical appliances and material of all kinds throughout the South.

George A. Tower, President.

Business Has Increased Well Over a Year Ago.

WESTERN ELECTRIC COMPANY, NEW YORK.

The business of the Western Electric Company for July was three per cent greater than last July, and for the seven months ending July 31, the business is running at the rate of over $67,000,000, which was the estimate of the business made at the beginning of the year that the company would do for the year 1912.

In some portions of the business, especially in lighting and the general supply business, July was the largest July in the history of the company, and not only is the business better, but prices are better than a year ago.

The portions of the country which seem to have responded most slowly to the increasing business are the West and the Pacific Coast, while in the East, the South and the Central West, business has increased well over a year ago.

Not only has the business increased, which refers to the business actually completed and billed, but also the orders taken during these seven months are greater that the sales. In other words, the orders on hand at the first of August are approximately $1,500,000 greater than the orders on hand the first of January.

Business outside of the United States is also good, and shows even a more satisfactory rate of increase than in

the United States itself. This is partly due, no doubt, to the greater and more systematic efforts being made by the company in securing business outside of the United States, as it is devoting much thought and time to extending its export business.

The number of employees at the end of July was upwards of 27,000; almost 4,000 greater than at the beginning of the year.

Plans have been made for some new buildings at Hawthorne, near Chicago, Illinois, which will cost approximately three quarters of a million dollars, to take care of an increasing business in the future, and also along the lines of the general policy of concentration of the manufacturing at Hawthorne, where upwards of 11,000 people are now employed.

Gerard Swope,
General Sales Manager

Conditions Better Than for Some Time.

FULLERTON ELECTRIC COMPANY, NEW YORK.

After having just made a trip covering the principal points in the New York state territory, and also part of the Pennsylvania territory, I feel that the conditions in the electrical supply line are much better than they have been for some time, and believe that the future months that are left in this year will show a considerable increase over the same period of last year.

We find that after an unsettled condition in the market for six months that prices are becoming more uniform, and that the whole line is steadying down to a good business basis. I also find that there is considerable work contemplated, and at the present time we have every reason to believe that this work will come on in the early fall.

F. W. L. Fullerton, President.

Outlook Very Promising.

J. B. TERRY COMPANY, CEDAR RAPIDS, IOWA.

Answering your favor of August 16, the outlook for sales of electrical supplies and equipment is very promising. I believe the public generally is only beginning to appreciate the many values of electricity.

J. B. Terry, Manager.

Should See a Gradual Improvement.

WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, EAST PITTSBURG, PA.

Answering your inquiry of the 16th inst., the indications are that business is improving and that for the fall months we should see a gradual improvement in general business conditions. The outlook, at least, gives this indication.

E. M. Herr, President.

Present Outlook One of Substantial Improvement.

FRANK H. STEWART ELECTRIC COMPANY, PHILADELPHIA, PA.

In my opinion the present outlook in the electrical business is one of substantial improvement, and due entirely to the bountiful crops of our farms, which will soon decrease the cost of living and bring about a larger trade balance abroad in our favor.

Free and undisturbed circulation of money makes good times, and I am in hopes that the period of unrest and agitation we have had to endure for a considerable period will fade away in the near future.

The political situation will be the event of the American people, and after presidential election I am inclined to think matters will be considered settled in accordance with the will of the majority; and then with big crops in our hay mows, wheat bins and corn cribs, we will settle down with an easy swing to a satisfactory volume of business and profits.

If next year's crops are as good as this year's we may then expect a business boom of considerable size. Big crops will do more than all other things combined to make and keep us happy and prosperous.

There is no question regarding the improvement in present conditions.

Frank H. Stewart, President.

Conditions Recently Nearer Normal.

MILLS ELECTRIC COMPANY, PEORIA, ILL.

While the early months of 1912 did not compare favorably with 1911, in point of volume, we find conditions more recently nearer normal. Many small electric lighting commercial plants, heretofore operated independently, have been purchased by large syndicates, causing concentrated buying. This temporarily works a hardship on the smaller jobber, and we notice that we are not always able to hold the accounts which we enjoyed while the plants were independently operated. To offset this, we are making a greater effort than usual to obtain business from reputable automobile garages, and the outlook for fall business is quite promising.

Resale conditions on patented articles have not been satisfactory this year, and the writer hopes that both branches of Congress may enact legislation permitting, within reasonable limits, restricted resale of patented articles. The jobber is a necessary part of the electrical business, and is entitled to a reasonable return for the service rendered. Present conditions make it necessary for us to handle several lines at margins of profit which are less than the cost of doing business.

The writer would like to see the electrical fraternity take some concerted action looking toward better resale conditions, and if this cannot be accomplished under the present laws, efforts should be made to have new laws enacted.

Leroy A. Mills, President.

Southwest Conditions Greatly Improved.

NUNN ELECTRIC COMPANY, AMARILLO, TEX.

I am in receipt of your letter of the 14th inst., asking my opinion of the present business outlook. It gives me great pleasure to advise you that the business outlook for the coming months is better than it has been any time within the past two or three years.

Crop conditions in Oklahoma are greatly improved over last year's, and one of our salesmen who has just returned from that territory advises that the people there are in a much better frame of mind than they have ever been before.

In New Mexico there are several plants which are being rebuilt owing to recent purchases and changes of management.

In the Panhandle of Texas there are one or two new plants being installed, and everywhere in this territory business is looking considerably better than it has for the last two or three years.

We predict a very heavy business the coming season. In fact, if it keeps up as the present month is doing our business will more than double.

J. L. Nunn, Manager.

Outlook Best Since 1906.

ROBERTSON-CATARACT COMPANY, BUFFALO, N. Y.

The outlook for the electrical industry in this part of the East, during the next few months is the best that it has been since 1906.

Crop conditions are good, the supply of labor is just about equal to the demand, the railroads are in the market and improvements and enlargements are occurring in factories and machine shops, which cater to the railways and building trades.

W. E. Robertson, General Manager.

Business in Very Healthy Condition.

ST. PAUL ELECTRIC COMPANY, ST. PAUL, MINN.

Answering your favor of August 18th will state that all is optimism in this section, every line of business is reporting improvement, and when our immense crop is harvested every business house will be benefited.

We do not feel the benefit yet in our line, but we are looking forward to and anticipate the biggest business in our history for 1913. Business is in a very healthy condition.

B. B. Downs, President.

Material Improvement Already Felt.

SOUTHERN-WESCO SUPPLY COMPANY, BIRMINGHAM, ALA.

We have suffered this year on account of the great deal of rainy weather which has retarded and held back improvements of all kind and extensions. However, this district has every reason to feel that the next few months will bring most satisfactory business conditions. There is a material improvement already felt and we are expecting better than normal conditions for the rest of the year.

Oscar C. Turner, President.

Graphite.

Graphite is of two general classes, natural and artificial, and natural graphite may again be divided into two classes, crystalline and amorphous. The crystalline graphite is found in veins and as flakes in crystalline rocks, the graphite in flakes constituting but a small percentage of the rock. The amorphous graphite is found in solid beds or pockets and has usually been formed by molten rock coming into contact with coal beds, heating them highly and changing them into graphite. This heating process, with some modification, is that employed in the artificial manufacture of graphite.

Recent Progress in Electric Lighting.

While the past twelve months have not been noted for the advent of any new departure in electric lighting radical enough to be called epoch-making, the absence of the same by no means implies that there has been a lack of progress. Quite on the contrary, there has been a steady development in a number of important phases of the electric lighting industry, the progress in each being of that slow but positive variety which often is more healthy and therefore more desirable than any sudden or revolutionary change from which there may be a reaction afterwards. However, such gradual changes are not always clearly discerned by those who are absorbed in their work, hence it is well to pause occasionally and note the trend of developments as found in various phases of the electric light field.

Tungsten Lamps and Light Distribution.

As for the lighting units themselves, we find progress on all sides. The tendency towards using tungsten lamps of high candlepowers (400 or 500 watts or even higher) seems to have had its day as far as store lighting is concerned, it having been sufficiently demonstrated that smaller tungsten units can easily compete with the so-called "gas arcs." So also, the emphasis which central stations placed on the need of a higher intensity of lighting, and which enabled them to introduce the more efficient tungsten lamps without reducing their output of energy, has served its purpose. Having become firmly established the tungsten lamp can now freely be selected in such candlepowers as may best suit the desired light distribution, offering a wide range between the smaller units (which predominate for residence and commercial lighting) and the high-candlepower lamps which are effectively replacing arc lamps in so many industrial plants.

Moreover, the light from tungsten lamps of all sizes can now be distributed with far greater precision than heretofore, owing to the careful standardization of lamp sizes, which not only has brought a uniformity in lamps hailing from different factories, but also has led to a far greater exactness in the dimensions of lamps made by any single factory. Formerly, it was not uncommon to find variations of a quarter of an inch in the height of mounting of lamps of equal candlepower made by the same factory, with resulting variations in the light distribution produced by exactly similar reflectors. Now the standardizing of the lamp sizes, together with the shortening of the filaments in the new drawn-wire tungsten lamps, allow reflectors to be used with far greater precision. Indeed, the National Electric Lamp Association certainly rendered a fine service to the cause of efficient lighting when it effected a standardization for which we might easily have waited another five or ten years if the lamp factories and a certain reflector factory had not been so closely allied.

Moreover, the renewed tendency towards the use of a large number of smaller scattered lamps in place of the high-intensity tungsten units for store lighting, is in harmony with the findings of our leading illuminating engineers. The discussions at the last annual meeting of the Illuminating Engineering Society implied that the intensity of illumination needed for a given work by any individual decreased as the number of sources of light was increased. This has been confirmed by later investigations and is showing its effect in a tendency toward a greater diffusion of light than was obtainable with units of high candlepower.

More attention is also being paid to the "overall" efficiency of lighting units as affected by dust, some central stations having started the practice of employing cleaners who attend regularly to the lamps and reflectors used by their business patrons, while makers of both indirect and semi-direct lighting fixtures are fitting some of these with dust-excluding covers.

Arc Lamps and Street Lighting.

The crowding out of the old types of both open and inclosed arc lamps has continued steadily, both being replaced partly by large tungsten units and partly by flaming or magnetite arc lamps. By placing the mechanism of magnetite arc lamps below the globes, as is done in the so-called "ornamental luminous" arc lamps, these lend themselves to handsome effects in single-light lampposts. Considerable work has been done on flaming arc lamps, which have been rendered more efficient partly by raising the voltage at the arc, partly by using chemicals which will vaporize at higher temperatures, and by providing condensing and cooling chambers for the vapors, thereby permitting of operation with a diminished supply of air. Thanks to these developments, the inclosed flaming arc lamp can almost equal the open one in efficiency, while greatly reducing the cost of carbons and of attendance, the carbons being shorter in length than formerly. The adoption of 90-hour series alternating-current flaming arc lamps for an installation of 10,000 new street lamps at Chicago, is typical of what may be expected in other cities and in line with a tendency towards a more intense illumination of business streets, while the luminous or magnetite lamps continue to spread where a lower intensity of light is considered ample.

Vapor Lamps and Orthochromatic Light.

The most notable newcomer in lighting units is the quartz-tube mercury-vapor lamp, which is just beginning to get a foothold in this country, although it has been used in Europe for several years. The forms already offered here differ from the European types in having condensing chambers for cooling the terminals in place of the metal ribbon radiators used in the European lamps. They are intended for use where high suspensions are possible and where a greenish light is not objectionable. (In Europe, quartz-tube lamps have long been available also in types suitable for semi-indirect lighting in shops or drafting rooms having comparatively low ceilings).

The introduction of the quartz-tube lamp, which is even more efficient than the glass-tube mercury-vapor lamp, may intensify the discussions between those who advocate a close duplicating of daylight in our artificial illuminants and others who recommend the monochromatic light as conducive to a greater visual acuity. Efforts are being made in many quarters to duplicate daylight by various combinations of lighting units, as for example, by combining tungsten and mercury-vapor lamps. So also, the color of lamps is being changed subtractively, as by using glass of peculiar composition for the inclosing globes of tungsten lamps, by the fluorescent screen now used to some extent with mercury-vapor lamps, or by the absorptive glass screens as fitted to arc lamps offered for color matching.

Industrial Lighting.

Industrial lighting has shown four notable tendencies during the past year, one being the steady inroad made by flaming arc lamps and by large tungsten units where a high placing of the lamps is permissible. Another is the growing practice of planning such lighting scientifically, instead of sticking up lamps here and there. A third is the more general use of carefully designed metallic reflectors made with reflecting surfaces absorbing a smaller percentage of light. Studies of the absorptive power of shades of various materials have made it pos-

sible to choose these more wisely for use under various conditions, while the advent of shades with adjustable holders allows the lamps to be mounted with a desirable positioning of the filament in relation to the reflector. Such carefully fitted reflectors being available for use with 400 and 500-watt tungsten lamps, the latter have found a ready introduction into industrial plants, round-houses and the like, being easily positioned where arc lamps could not readily be reached for trimming. At the same time, the mercury-vapor lamp has continued to find favor in industrial lighting, partly because it can be placed close to the windows so as to have the artificial lighting come from the same directions as the daylight illumination.

Last, but not least, is the tendency towards figuring the cost of better lighting not in terms of foot-candle illumination, but of increased shop efficiency. The discovery—for such it may well be called, since it came as a surprise to many able electric light men—that the total cost of lighting a shop, equals only a small fraction of the payroll of the same shop, has given the progressive contract agent a new basis on which to interest the industrial plants. Now instead of talking higher illumination, or better light distribution, or in some other terms that sound like mere abstractions to the men he is trying to interest, he can plead for the more efficient use of labor or for an increased daily output—both points on which the shrewd factory manager is immediately open to reason and to conviction.

Semi-Indirect Lighting.

Another tendency which has been growing in this country for the last half year, though not yet as marked as it is in Continental Europe, is that towards the use of semi-indirect lighting fixtures—that is, of fixtures allowing part of the light to be thrown directly on the tables or goods, while another portion of the light is directed upwards and reflected either by the ceiling or by special diffusing plates. Although not designed for that purpose, the opalescent or moonstone inclosing globes or balls, which were so popular for several years acted as fixtures of this general class. In their absence, the problem of dividing the light and using it efficiently without glare was attacked several years ago in Europe, but was generally dodged in this country owing to the craze for luminous-globe effects.

Now that the latter has run its course, the inclosures for lamps are being designed more systematically; some of them being still of the ball shape, but with the lower half matted and the upper half prismatic; or with a reflector party filling the upper half of the globe. Other fixtures have shallow opalescent bowls of beautiful tints, or of alabaster hue, open upwards so as to soften the direct rays of the lamps and to reflect part of the light against the ceiling. The fact that fixtures of this latter type are being widely advertised in popular weeklies, will undoubtedly increase their use and the coming months should bring a vast variety of artistic and efficient modifications of such fixtures.

Meanwhile, the indirect rays from the lamps to the objects lighted have been invading all parts of the country and will undoubtedly continue to enjoy a large scale, although there are many who consider them too extreme for most purposes and who welcome the semi-indirect fixtures as happy mediums which permit of any desired proportioning between the amount of the direct and the diffused or reflected light.

Tungsten Street Lighting.

Whether the quartz-tube mercury-vapor lamp will be an important factor in street lighting cannot yet be foretold, though some of the European experience as well as the new Randolph Street installation at Chicago would imply that it may have a place in this field when conditions permit of a very high mounting of the lamps. For street lights placed well within the angle of vision, tungsten lamps continue to invade both business and residence streets, but with more frequent departures from the former method of supporting them on posts lining both sides of the street. The Chicago tests, showing that a superior effect was obtainable by replacing all lamps on one side of the street, having demonstrated what simple surprises progress may occasionally bring with it and the increased variety of center-suspension tungsten fixtures reflects a revived demand for lamps supported over the middle of the street.

The height of street lamps is also receiving more careful attention and the success of a committee of the Illuminating Engineering Society in securing a higher mounting of the new flaming arc lamps at Chicago ought to encourage others to interest themselves in similar ways. Opinions still differ considerably as to the most desirable heights for tungsten as well as arc street lamps, although many efforts have been made within the last few years to establish a dependable basis for calculating these,[1] and the systematic efforts now being made in so many parts of the country towards planning really creditable installations of street lamps ought soon to show good results. Whether these will also result in a more extended use of prismatic reflectors interposed between the tungsten lamps and the usual opalescent plobes, seems doubtful. Such combinations have been introduced to some extent during the past year; but in spite of the improved light distribution obtained by the same and of the widespread adoption of carefully chosen reflectors in connection with indoor lamps, the general practice has been to let the light of street lamps distribute itself at random. However, the offering of metallic hood-shaped reflectors for use over tungsten street lamps may call renewed attention to the wastefulness of the common methods and perhaps the coming year will mark an advance in this direction.

Undoubtedly, some of the shortcomings in the lighting efficiency of many of the tungsten lamppost systems installed in recent years can be traced to the emphasis placed on the business advertising value of the installations. From an advertising standpoint, these display street-lighting installations have certainly been a success both for individual streets or blocks and for cities as a whole, and the backing of such special installations by local associations of merchants still continues. However, the type of posts used and the general construction has been improved greatly and has made the more recent installations creditable by daylight also. Moreover, it has forced the use of a considerable higher intensity of illumination within the adjoining stores, and in some cases, even within adjacent churches. For the staid and display-shunning churches are waking up to the fact that they also need better lighting and the coming year will undoubtedly bring more of them into the general class of brightly lighted establishments.

1 The well-known illuminating engineer, L. Bloch, writing in *Elektrotechnik und Maschinenbau*, has recently advanced the plea that the height of tungsten street lamps should depend only upon their candle-power and not on their spacing. His rule for figuring the height in feet is to divide the square root of the candlepower by three and to add the quotient to 11.5.

Wireless Station in Boston.

A novel window attraction in the new store of the William Filene Sons' Co., in Boston, is a complete Marconi wireless system which is being operated in full view of the public. Two show windows are devoted to working models. When the building, now unfinished, is completed, a practical working station will be operated, open to public patronage. The sending instruments will have an effective radius of from 300 to 1,000 miles.

MODERN FLAME-ARC LAMPS AND THEIR FUTURE POSSIBILITIES.[1]

By W. Hechler.

The latest requirements are for a lamp which will burn for a long time without attention, and have also a high efficiency. This seems merely to demand a lamp provided with suitable carbons, but it is only quite lately that a solution of this kind has been discovered in America. The only other solution seems to be to lengthen the electrodes, which have been made as long as 30 inches, or to use magazine lamps or similar devices. Another suggestion, made by the author two years ago, is to use a kind of inclosed flame arc, but while this effected a slower consumption of the electrodes, the efficiency was by no means good. Usually a series resistance, amounting to 37 per cent of the whole, is used with flame-arc lamps. The experiments showed that not a tenth part of this resistance is really necessary, from the theoretical point of view of the characteristic of the lamp; practically, in order to reduce the starting current, some slight excess of this amount is doubtless necessary. The composition of the carbons affects the matter, and if suitable additions are introduced into their composition, this may have the effect of steadying the light, and of allowing a higher voltage to be applied. This would tend probably on the whole towards an increase of efficiency.

Experiments show that if the voltage across the lamp is kept constant, the watts per candle decrease with an increase of current. On the other hand, if the current is kept constant, the curve connecting voltage and efficiency is hook-shaped, and there is therefore a definite value of the voltage which gives the highest efficiency. This value is, however, considerably above that at which such lamps are usually run, though with the magnetite arc there is no difference in this respect. It is very necessary to bear in mind that this value of the voltage which gives the highest efficiency with a given current depends entirely upon the composition of the electrodes, and statements to the effect that efficiency increases with voltage, as reported by a variety of observers, must be accepted with caution. All sorts of experimental errors and difficulties are liable to arise with work of this sort, and things are by no means so simple as they have appeared to many observers.

Let us consider what actually takes place. Light is emitted partly from a glowing electrode and partly from an incandescent gas. The earliest experiments showed that 25 per cent of the light was given out by gases. These results were usually obtained by inverting the arc, and so cutting off, as far as possible, the light emitted from the crater, the results so obtained being compared with those obtained from the normal lamp in its usual positions. But this method seems very questionable, and with an inverted arc the incandescent portion is probably exposed to decided cooling reactions. The author in 1905 gave reasons for thinking that the incandescent gases contributed about 36 per cent of the total output, but even in this case there were many very uncertain factors. A more promising method seems to be to make indirect determinations, and to ascertain the distribution of energy throughout the arc. If, without exposing ourselves to well known pitfalls, we could find the voltage drop across the incandescent gases, we should have what we want. If curves could be constructed for different types of lamp showing the variation of voltage with the distance between the electrodes, the current being kept constant, this would be a first step. Thus, with an extremely small distance between the electrodes, the voltage required to produce the given current would be the sum of the voltage drops at anode and kathode. With the aid of curves, the author gives reasons for thinking that with a current of 6 amperes, and a voltage of 45 applied to homogeneous pure carbons, 3 per cent of the energy consumption takes place in the incandescent gases; with 80 volts applied to a magnetite arc, about 70 per cent of the energy consumption is due to the gases; and with 40 volts applied to an ordinary flame-arc, from 55 to 60 per cent of the watts are absorbed by the gases. This seems to justify us in thinking that as a rough approximation about 55 to 60 per cent of the light emission of a flame-arc lamp is due to the incandescent gas, while the remainder is due to the surfaces of the electrodes themselves. If such figures are correct, it is evident that any change in the shape or length of the path of the gases will further affect the question of their light-emitting properties. There are good reasons for not reducing the length of the arc below a certain limit, but within the limits usual in practical work, the length of the arc may be said to vary with the voltage. Therefore, assuming that the electrodes are of a certain composition, there is a certain length of arc below which the efficiency decreases, and this can be shown experimentally to be the case. On the other hand, an increase of voltage drop in the gases improves the efficiency, as is shown by results obtained on quartz-tube mercury-vapor lamps. It is also well known that an increase in the size of the electrodes decreases the efficiency, if nothing else is changed, and this is due to an increased cooling effect.

With the inclosed type of flame arc, a decreased supply of air produces effects that must be considered. With an open arc the heat is produced primarily by the current, but is also partly due to the heat of combustion of the carbon, which necessitates a supply of air. If the access of air is hindered in any way, the heat of combustion is decreased, the temperature of the arc and consequently also the emission of light tends to fall. Therefore, more energy must be supplied electrically if the temperature is to be maintained, and the voltage must be raised, if the current remains constant. Thus, an inclosed lamp requires a higher voltage than an open one, if the current and length of arc are the same in the two cases. This difference is due to the voltage drops at the electrodes, which, with an open arc, amounts to about 50 volts, and with an inclosed arc to 70 volts. On the other hand, the length of the arc is shorter in an inclosed lamp than in an open one, if the voltage and current are the same in both cases. These differences are connected with differences of temperature, and the loss of efficiency is to be explained in this way.

In order to meet these objections, inclosed flame-arc lamps are usually supplied with electrodes containing a greater amount of the special salt employed; in this way the length of the arc can be made to be the same in the two cases. But any increase in the amount of salt present in the electrode introduces a distributing influence on the burning of the lamp, and a completely satisfactory solution cannot be found in this way. The phenomena hitherto mentioned have special reference to direct-current lamps.

The author is therefore of the opinion that with the electrodes at present in use, an increased efficiency is not to be obtained merely by increasing the voltage. The electrodes themselves must be improved, and must be capable of burning on high voltages without great lengths of arc. This is one of the problems with which the future experimenter must deal. But we may well consider how far we are at present utilizing our resources. With arcs, the ratio of the visible radiation to the total radiation varies between 0.1 and 0.17, according to the nature of the electrodes; with the latest kind of metal filament, this figure varies between 0.04 and 0.05. Unfortunately, there seems to have been no work done on absolute quantitative determinations of the energy emission throughout the spectrum by a flame-arc lamp. But under similar electrical conditions, salts intended to give a white or red tinge to the light

1 Abstract of paper in the *Elektrotechnische Zeitschrift.*

seem to produce a yellow light, the percentage of the salt being assumed to be the same in all cases.

Some tests made soon after the introduction of flame-arc lamps seem to show that with a given salt the efficiency increases up to a certain percentage of the added salt, after which it seems to remain constant. It is not possible from the published results to find out whether the length of the arc affected the results; but supposing this not to be the case, the following explanation seems to cover the ground. It seems likely that at this critical percentage a limit is reached at which the largest possible amount of the added salt is absorbed in the path of the incandescent gases, and thus contributes to the increase of the emission of light owing to the vapors of the salts in question; beyond this limit, any excess takes the form of fumes, which leave the surface of the electrode without entering the column of flaming gas. It is very important to ascertain that the salts, which reach the vapor column, should be capable of reaching the high temperature of the arc before they leave the zone, otherwise they cannot be considered to contribute effectively to the efficiency of the lamp as a whole. It seems obvious that it would be well to give the preferences to such metals or their salts as have been found in metallic filaments and in other sources of light to yield a high efficiency at incandescent temperatures. This has been found to be the case, and such combinations have turned out to be an improvement on the salts formerly used.

The Welsbach lamp owes its luminosity to one per cent of ceria, and a mantle of pure thoria is known to have no light-emitting properties. Any change in the proportion of ceria to thoria is known to have a harmful effect. Similar facts can be proved from an examination of additions made to magnetite electrodes. An addition to zirconia less than 50 per cent improves the light, and the same is true with uranium oxide. The oxide of titanium improves the light, the best result being obtained when the electrode consists entirely of the titanium oxide, but the practical use of electrodes which contain nothing but titanium oxide is very difficult, and other salts have to be added, which detract, of course, from the efficiency. Enterprise of manufacturers may lead them to a solution of the problem; many suggestions have been made in various patents, and many experiments have been tried. But if real success in this department is to be achieved, much careful work will have to be done, and the inclosed flame-arc lamp must be so constructed that an improved efficiency is not obtained at the cost of other essentials.

Illumination of Randolph Street, Chicago, by Quartz Lamps.

A new development in American street-lighting practice is represented by an installation of quartz-tube mercury-arc lamps on Randolph Street, between La Salle Street and Fifth Avenue, in Chicago. Although this installation is but one block in length and involves the use of only six lamps, it shows very strikingly the advantages possessed by this new illuminant. The installation is also an admirable one from many points of view.

Among the commercial interests in this block are two hotels, whose managers believed that their patronage was suffering from the competition of other hostelries nearer to the center of Chicago's loop, or central business district. By co-operating with their neighbors the Randolph Street Business Men's Association was formed, with Karl Eitel, of the Bismarck Hotel, as president. One of the first things it has set out to do is the brilliant street illumination of the block in question. Although its primary object was to attract trade, another object was to point out by contrast how poor the present illumination of most of Chicago's downtown streets really is, and therefore to stimulate the city's business interests to take up actively the more uniform and thorough lighting thereof to a scale commensurate with their importance.

Randolph Street by Day, Looking East from Fifth Avenue.

Night View from Fifth Avenue.

After considering various types of lamps and systems of lighting, it was finally decided to utilize the new type Z quartz lamps manufactured by the Cooper Hewitt Electric Company, of Hoboken, N. J. The installation was designed by George C. Keech, illuminating engineer of the Chicago office of the company.

Close View of Lamp, Mounting and Wiring.

Night View from La Salle Street.

The block length is about 320 feet and the width of the street from building line to building line is 80 feet. The sidewalk on each side is about 15 feet wide. It was decided to use six lamps mounted on the building fronts about 40 feet above the street. The lamps are suspended 8 feet from the building, thus hanging over about the center of the sidewalk. The lamps are staggered so as to form an angle of 45 degrees between the street axis and the line joining opposite lamps. The transverse distance between the two lines of lamps is 64 feet, and between adjacent lamps on the same side of the street there is 128 feet. In order to accommodate a window, one of the lamps is slightly below the others, but this is not very noticeable.

In the accompanying illustrations is given a good idea of the arrangement and suspension of the lamps and of the excellent uniformity of illumination that they produce. The lamps are operated in multiple on a 220-volt direct-current circuit of the Commonwealth Edison Company, and each takes 3.5 amperes or 770 watts. The polar distribution curve of the lamp shows that the maximum candlepower is between 4,900 and 5,000 and also that the distribution is very favorable for such a powerful highly-suspended lamp. The mean lower hemispherical candlepower is 2,500, and at this rating the efficiency is 0.38 watt per candle. Inclusive of the bail and suspension hook, the total length of the lamp is 33 inches and its weight is 33 pounds. The lamp has an automatic starting device.

The lamps burn from dusk till 1 a. m. Averaging seven hours per night, at three cents per kilowatt-hour, the total energy and maintenance cost per year is only 69 cents per curb-foot. Practically the only maintenance required is periodical cleaning of the outer globes, which is a much simpler operation than with flaming arc lamps. Renewals of the quartz tubes will probably be much fewer than allowed for; they can be broken only by very careless handling. There is no trimming needed, as there is with all kinds of carbon or flame arcs. To facilitate inspection and cleaning the lamp suspension gear can be swung toward the most available window, thus making the lamp readily accessible. For the entire equipment of lamps, mountings and wiring, the investment cost was $1.00 per curb foot.

Tests made with an illuminometer at numerous points along the street and sidewalk, showed an average horizontal illumination of 1.67 foot-candles. The variation therefrom in no case exceeded 20 per cent. The night views herewith show only imperfectly the exceptional uniformity of illumination on the sidewalks and street. They also fail to give an adequate conception of the brilliancy of the entire street scene; the entire block seems to be filled with a bright but glareless light. The streaks in the pictures are from the lights of moving automobiles and street cars. The building fronts are well lighted. Electric and other signs are easily legible from a distance. The light is so penetrating that a policeman standing at one end of the block said he could clearly see every door and all the lower windows; in his opinion the detection of evil-doers and prowlers would become simple indeed if such illumination was made universal. High acuity of vision is manifest under the light, since it is easy to read an ordinary newspaper anywhere on the sidewalks of the block. Vehicles can be clearly seen from a long distance. Although the light is of a greenish color, it is not nearly so markedly so as that of the ordinary mercury-vapor lamps; in fact, one is unconscious of the color of the light unless attention is particularly directed to it.

New Electrical and Mechanical Appliances

New Diffusing Bulb for Tungsten Lamps.

The high intrinsic brilliancy of tungsten and tantalum incandescent lamps causes very pronounced glare when clear-bulb lamps are exposed in the field of vision. To overcome this it is necessary to surround the lamp with a dense diffusing shade or globe or to use a frosted-bulb lamp, sometimes both being used where an open shade or reflector is employed with low-hanging lamp. The use of frosted bulbs involves considerable decrease in defficiency, however, first from direct absorption of light and second from the accumulation of dust and dirt that becomes ground into the roughened surface so that it is practically impossible to wash it clean.

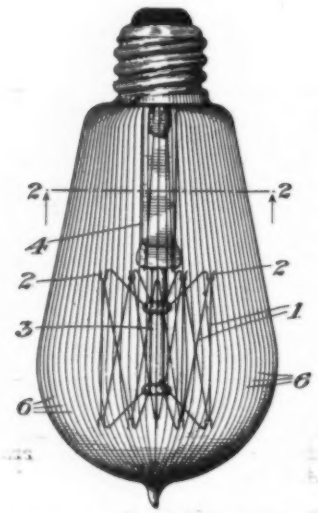


Fig. 1.—Ribbed Diffusing Bulb.

A recent invention of Peter Cooper Hewitt, of Ringwood Manor, N. J., that was patented on August 20, aims to overcome these difficulties, by providing a series of fine, smooth, practically parallel, longitudinal grooves in the outer surface of the lamp bulb. Dr. Hewitt claims that these grooves will not materially decrease the efficiency of the lamp below its clear-bulb value, but will make the surface of such a highly diffusing character as to give the entire bulb the appearance of a wide and uniform blaze of light much more grateful to the eye than the direct light from the brilliant filament.

Fig. 1. shows the general idea of the invention, except that the longitudinal grooves will be very much closer, the distance from center to center of grooves being only 0.004 to 0.01 of an inch for a 25-watt lamp. Fig. 2 shows the general shape of the grooves greatly enlarged. Their depth will probably not exceed one-third of the thickness of the glass wall. The ridges 7 will be steep-sided and sharp enough to have the desired wide-angle light-diffusing effect. The grooves 6 are formed by coating the outer surface of the bulb with a thin skin of wax or asphaltum on which suitable lines are scratched to expose the glass, which is then etched by subjecting it to the action of hydro-fluoric acid for some 10 minutes. This etching may be so carefully done as to leave the ribbed surface substantially smooth, but if desired it may be further easily polished since the grooves are practically parallel. This chemical method of forming the grooves does not materially weaken the bulb because it avoids the danger of producing incipient fractures or internal stresses that might be caused by mechanical methods. Other advantages of Dr. Hewitt's method are that it can be applied to bulbs of ordinary commercial thinness and, being very simple, it can be carried out by machinery, both factors keeping its cost within reasonable limits.

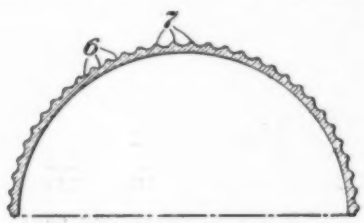
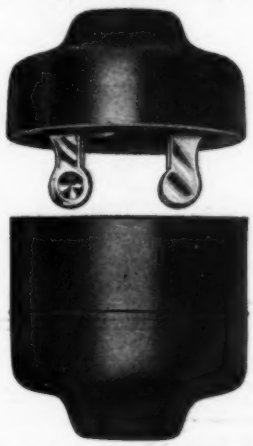


Fig. 2.—Enlarged Section.

New Cutler-Hammer Cord Connector.

The increasing use of all kinds of portable electric devices has created a field for the use of cord connectors. These devices are convenient where used with table lamps which are connected to base receptacles. To move the lamp or table it is then only necessary to separate the cord connector, placed in the cord near the lamp and the cord, which is often run under the rug, need not be disturbed. With portable vacuum cleaners they provide convenient means for disconnecting the long portable cord from the cleaner. Tailoring and laundry irons can be easily connected and disconnected by means of a cord connector placed on the cord within convenient reach, as may also electric drills, hammers, etc. In fact, wherever a long cord is used one of the new connectors put on the market by the Cutler-Hammer Manufacturing Company, of Milwaukee, Wis., can be used to advantage.

The accompanying illustration shows this device, which consists of a body with detachable cap. The contacts lock firmly and yet are released by a pull in any direction. The black insulating material used in making this connector is the same as has been developed for other Cutler-Hammer switch specialties in the ceramic laboratory of the company. This material molds accurately and permanently so that the contacts are maintained in alinement.



Cutler-Hammer Cord Connector.

The Prize-Winning Electric Safety Lamp for Miners.

The Ceag lamp which was awarded the $3,000 prize in the English miner's safety-lamp competition was produced at the request of a continental mine owner after a big mining disaster. It is now used to the large extent of 20,000 lamps, and at the Bullcroft main

colliery, near Doncaster, England, there is a modern Ceag lamp-cabin building for 3,000 lamps.

This lamp has three parts, viz., the accumulator, and the bottom and top parts, and it weighs just over four pounds. The judges submitted it to trial for soundness of construction by throwing it onto a stone floor, and it suffered no damage. The accumulator consists of a strong celluloid casing and two lead electrodes which are screwed into the lid of the casing and are of circular shape. A novel acid-proof closing arrangement of the battery permits free egress to the gases without allowing the liquid to escape.

Ceag Electric Safety Lamp for Miners.

The lid is readily detachable so that the electrodes can easily be exchanged. On both pole ends are two detachable contacts on springs which form the contact for the current to the incandescent lamp; this prevents oxidizing of contacts, as they can be cleaned with warm water. The accumulator is separated from the intermediate space by the steel casing.

The bottom part of the outfit is shaped like a round pot of heavily tinned drawn-steel plates, strengthened by steel ribs pressed into it. The pot is of cylindrical shape, somewhat conical. On the bottom there is a small furrow which keeps the accumulator in its position, without preventing its easy removal.

The top part of the device, is fastened with a bayonet joint on the bottom casing for quick detachment. The lamp is locked with a magnetic lock which can only be opened by a strong magnet. The connection between the loose contact and the lamp is effected through a brass segment placed into the insulating material making it possible to switch the light on and off by turning the top part while the lamp is locked. A 1.5-candlepower metal-filament lamp is used. Charging takes from 4 to 5 hours and a continuous light can be obtained for 16 hours. The bulb is protected by a thick glass dome and four iron bars, and it is placed between spiral springs. Bulb economy is claimed to result, and safety against fire damp is assured as the circuit is broken automatically in case the dome is shattered.

The lamp is manufactured by the Ceag Electric Safety Lamp Company, 19 St. Dunstan's Hill, London, E. C.

A 75-year concession for utilizing the water powers of the Caucasus and transmitting electricity at high tension throughout that region, has been granted by the Russian Government to a British engineer, with permission to transfer his rights to a foreign company.

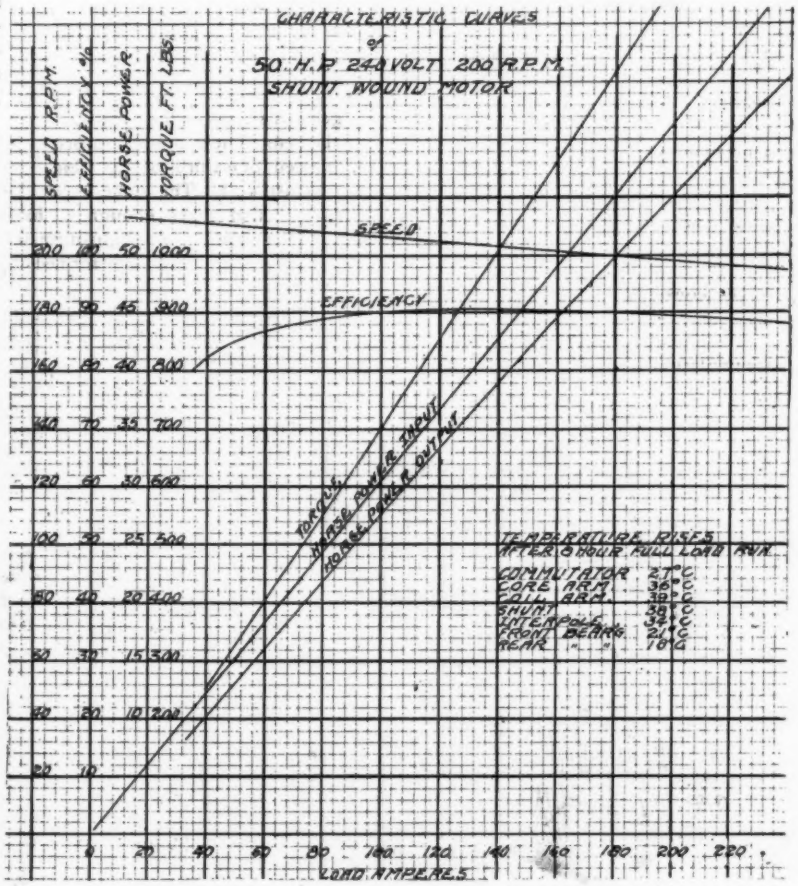
Diehl Ceiling Motor.

Mention was made in these columns on page 231 of the issue of August 3 of a new design of ceiling-suspension motor developed by the Diehl Manufacturing Company, Elizabethport, N. J.

Further facts relating thereto are now available. These motors are direct-current commutating-pole machines rated at 50 horsepower, 240 volts and 200 revolutions per minute.

Owing to the fact that the machines are to be suspended from the ceiling and were intended for shipment across the Atlantic Ocean for foreign installation, the machine was designed to be as light and compact as possible. To this end a high grade of steel was used for the motor frame and poles. The result is a motor which is very light in weight, high in efficiency and small in space required. The pole pieces are built up of laminated sheet steel, of high magnetic characteristics and are assembled on rivets securely bolted to the frame. The interpoles are made of machine steel. There are six main poles and six interpoles.

The armature is built of carefully annealed steel laminae, which are thoroughly insulated from one another. The armature copper is a heavy strap winding and is securely banded in place by



Characteristic Curves of New Diehl Ceiling Motor.

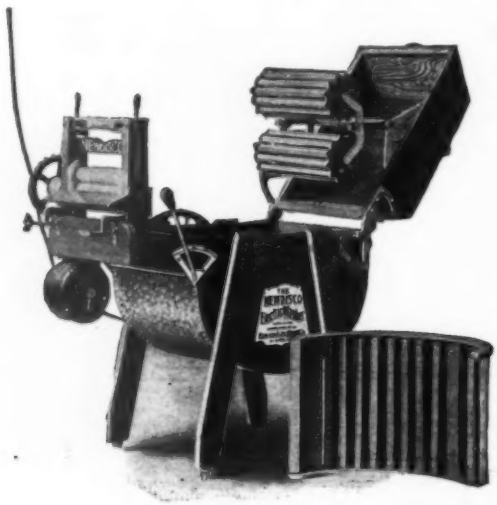
phosphor-bronze band wire. The end bands are of steel. The armature coils are form-wound and are therefore easily replaceable.

The overall dimensions of the motor are as follows: length along shaft over bearings, 47.5 inches; width transverse to shaft, 45 inches; outside diameter of yoke, 44.5 inches.

The curves herewith show the result of the test of this machine. It will be noted that the commutator temperature is low, showing a large radiating surface and small losses; this is also true of the bearing temperature. The efficiency curve of the machine from three-fourths load to one and one quarter load is practically flat. This, as well as the close speed regulation, is due to the interpole winding. The speed variation from full load to no load is very small for a motor of this size, being 13 revolutions out of 200.

The Newdisco Electric Washer.

The Newton Disk Plow Company, Newton, Iowa, has placed upon the market the Newdisco washer, which is shown in the accompanying illustration. The washer is driven by an electric motor and as it is light running the cost of operation is low. This washer is designed on the principle of a washboard, thus eliminating all need of rubbing, and doing the work quickly. It will wash any kind of clothes, heavy carpets or bedding and will not injure the finest clothes.



Newdisco Electric Washer and Wringer.

Raising the lid throws the washer out of gear and this can be done without the necessity of stopping the motor; hence clothes can be inspected or more water added while the machine is running. A reversible wringer is supplied and the washer and wringer can be run at the same time and by the same motor.

Independent Compound Starting and Regulating Rheostats.

The compound starting and regulating rheostat illustrated herewith is a device designed for properly starting a motor and giving a wide regulation of speed by inserting resistance in the shunt field.

In this rheostat, which is made by the Independent Electric Manufacturing Company, of Milwaukee, Wis., there are two sets of resistance, namely the armature resistance and field resistance, and two levers are employed. The larger or left-hand lever is used for starting duty only while the smaller or right-hand lever is used to insert resistance in the motor field. When starting the motor the left-hand or starting lever is moved towards the right to the last or running position, at which place it comes in contact with the no-voltage release magnet, the attraction of which holds this lever in its running position. The spring at the hub of the lever prevents it being left in any except the running positions.

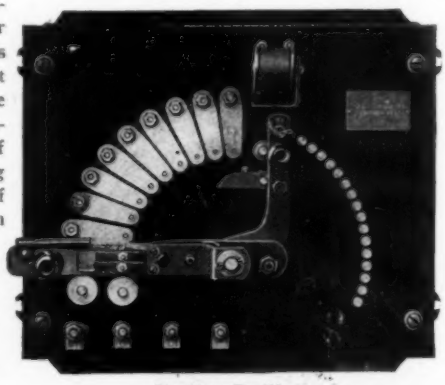
When the starting lever is in its running position, the right-hand or field-resistance lever is automatically released and thus made free to move toward the right. This lever, however, cannot be moved until the starting lever is in its running position. By moving the field lever across the contacts to the right, resistance is inserted, weakening the motor field until the desired speed is attained.

The two levers are mechanically and positively connected so that when the starting lever is at the off position the field lever must always be at the extreme left or on the first button where it is locked and remains locked until the starting lever is in its running position and held in place by the release magnet.

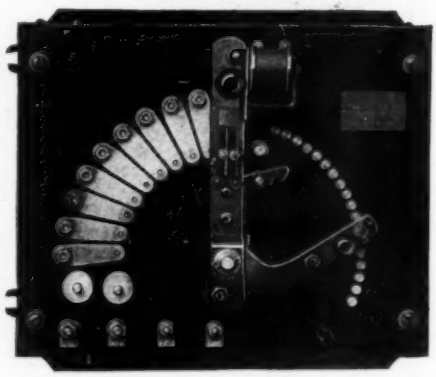
Should the voltage at any time fail while the motor is in operation, the release magnet releases the starting lever and the hub spring in the lever causes it to fly back to the off position and in doing so carrying the field lever also to its first button where it is automatically locked and cannot be moved again until the starting lever is on the running position. With this device it can readily be seen that during the starting of the motor and bringing it up to its normal speed the full field curent necessarily is in use and no short-circuiting switch is necessary to put the maximum field current in while starting.

Independent standard removable segments are used for starting, which are easily replaceable. The starting levers are of pressed steel equipped with automatically adjustable and removable brushes. The field resistance is composed of a special high grade, high-resistance wire wound on asbestos tubes, the wire being such that the resistance does not increase with heating.

The device may be obtained with an overload as well as no-voltage release, if so desired. This rheostat is fully covered by letters patent.



Starting Positions.



Running Position.

German Dry Cells.

The German Post Office Department uses over 1,450,000 dry cells for its telephone and telegraph lines. These have an average life of 2.5 to 3 years and give both economical and generally satisfactory service. The cost of the cells is about 37 cents apiece. Over 186 different makes have been tried out but only five manufacturers supply the present demands. Dry cells have completely replaced the Leclanché cells formerly in use. The specifications call for an electromotive force of at least 11 volts.

Triple-Service Reflectors for Street, Factory or Store Lighting.

To meet the demand for fixtures using the large tungsten lamps and employing a reflector which may be used efficiently with 250-watt, 400-watt and 500-watt Mazda lamps, the George Cutter Company, of South Bend, Ind., has developed a line of fixtures, two types of which are shown in the accompanying Figs. 1 and 2. The curve of the reflector, which is 22 inches in diameter and fire-enameled, is peculiarly adapted to the large sizes of lamps, and being adjustable vertically with

Fig. 1.—Cutter's Triple-Service Reflector With Insulated Suspension Ring.

respect to the socket supporting the lamp, directs the rays of light to obtain even diffusion and change the intensity to meet varying conditions.

In lighting a factory, present requirements may demand a concentrated source of light, but if certain machinery be moved, it may be desirable to use a different size of lamp and obtain different intensity with uniform distribu-

Fig. 2.—Cutter's Triple-Service Reflector With Insulating Pipe Joint.

ti n. In this case it is only necessary to change the lamp and make such adjustment as will give the desired illumination. Fig. 1 shows a factory type of this fixture having an insulated ring and bushings for open wiring, and Fig. 2 shows a similar fixture with insulating joint for vertical pipe as used in stores or places where the wires are run in conduit.

These reflectors are easily adapted to street-lighting brackets, mast arms, etc., and may be used with Alba globes to produce a soft light. They are made for use on multiple or series circuits.

The King Unit System of Ornamental Lamp Standards.

Among the innovations that have been brought forth because of the popularity of the ornamental tungsten-cluster system of street lighting is a very ingenious one developed by the King Foundry Company, St. Joseph, Mo. This company has produced a set of ornate designs of lighting standards, all embodying the King unit or sectional system. This sectional idea applies to the entire equipment, but is particularly valuable as regards the arms, side and top lamps, and their accessory ornaments. By simple

Three-Light King Ornamental Standard.

Five-Light King Standard.

changes and additions the same column can be altered from a one-light to a two, three, four or five-light cluster. Moreover, the four and five-light standards can be arranged either in the ordinary way with four horizontal arms or with only two arms carrying both upright and pendent lamps, all in the same plane. This makes possible the use of harmonious equipment throughout a city and also permits the ready addition of more lamps to each standard as the importance of the street or the appropriation available increases.

This highly desirable flexibility is brought about by the employment of all standard parts accurately made to be entirely interchangeable. In each case the lamps on the side arms may be made upright or pendent or subsequently reversed, if desired. Several designs of ornamentation are also available for the arms and brackets. All the designs are carefully proportioned to produce graceful effects and to give the appearance of solidity. The equipment is made of iron and steel of great strength.

One of the most popular five-light standards has a total weight of about 1,000 pounds and is 14 feet 6 inches high to the top of the highest lamps. The column is 8 inches in diameter at the base and 7 inches at the top. The arms are 18 inches long, making the maximum width of the post 44 inches. The upper globe is 16 and the lower ones 12 inches in diameter. The lamp equipment is usually 100-watt tungsten lamps, but other sizes of lamps and globes may be used. A good idea of some of the newest designs may be obtained from the two accompanying views.

The standards are also readily equipped with sockets for special festoon lighting for carnivals, holidays or important events. Flag-holders are also supplied for festive occasions. Thus the regular standard serving for every-day use can be easily made an integral part of special decorative effects for gala celebrations.

The company also makes a line of ornamental brackets for public buildings, clubs, hotels, etc., that harmonize with the equipment of ornamental standards for the curb lighting

A New Pull Socket Switch.

A new type of pull socket switch has been invented and patented by William Pfeifer, Jr., of Jersey City, N. J. The accompanying illustrations show its principle of construction, which it was aimed to make very simple in order to produce a low-cost device. Fig. 1 shows a sectional elevation of the switch mechanism; Fig. 2 is an elevation looking at Fig. 1 from the right and showing the partial section along line *2-2*; Fig. 3 is a sectional plan along the line *3-3*.

The circuit wires are *1* and *1a*, the former connecting through screw *3* to the screw shell and the latter through the switch to the central contact screw *2a*. The switch arms *6*, *6* are secured to the square rotatable block *S*. Above

Fig. 1.

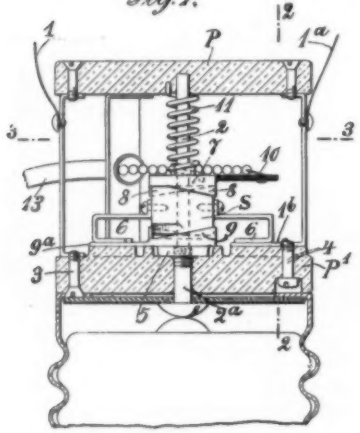
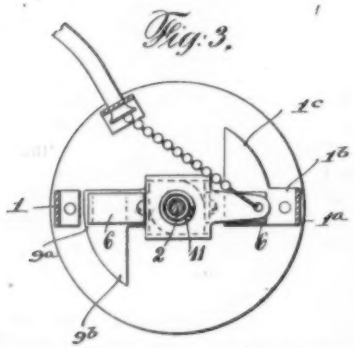


Fig. 3.



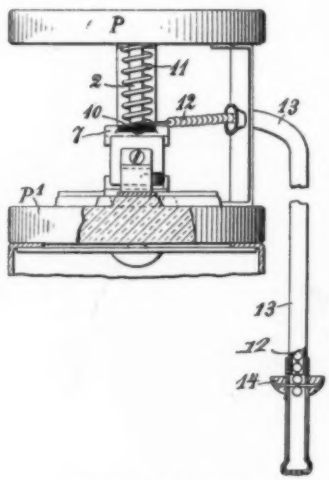
this is a square plate *7* with two reversely slanting flanges on opposite sides. Beneath *S* is a plate *9a*, *9b* and the nut *5* on the central screw spindle *2*. About the latter is the spring *11* pressing down on plate *7*, to which is secured an insulating arm *10* on the end of which the chain terminates. The chain moves in a pipe and has a ring *14* at the end; the pipe prevents pulling the socket and lamp sideways which may loosen the socket shell if it is not properly secured in the cap. Each pull of the chain swings the contact arms *6* through 90 degrees alternately making and breaking the circuit.

A Block Signal System.

During the last few years quite a number of inventions and improvements have become more or less known, which propose to increase the protection secured by the actually existing railway safety devices. Amongst the numerous plans proposed for the purpose, attention must be drawn to a perfectly automatic electric train-protecting system as ingenious as it is simple, that is creating the greatest interest in railway engineering circles.

This system, now patented in all civilized countries, overcomes the difficulties connected with securing a perfect protection to railway traffic and remedies the deficiencies still inherent in other semi-automatic and automatic block systems. It fulfills in a reliable

Fig. 2.



Pfeifer Pull Switch.

and incontestable manner the fundamental condition required, namely the mutual interdependence of the block stations. The compulsory character of the correlated positions of the block signals according to the movements of the train within the block section is always maintained and depends solely upon the external influence of the position of the train itself with regard to its respective block section.

The fundamental idea of the Unverricht-Gossler system is the *momentary influence of the train when entering a block section, upon the position of the respective signals*, it being impossible to change their position until the whole train has actually left the block section occupied and has entered the next which, moreover, it has likewise blocked. During this period the position of the signals is secured in a permanent and mutual interrelation, so that for the time being the train cannot affect the signals any further.

This mutually compulsory condition of the positions of the signals is brought about and controlled exclusively by a unique switch, this device being substantially the gist of Mr. Unverricht's invention. These switches, in consequence of their mutual interrelation and reciprocal action, are called duplex *rocking switches*.

A switch will occupy two different positions: (1) The *normal position;* (2) the *abnormal or blocking position.*

The switches are interconnected by means of wires so that their positions are mutually dependent and so that the one switch can only be rocked back from its blocking position into its normal position by the other switch, after the latter has, in its turn, assumed the blocking position.

A switch can only be rocked from its normal position into its blocking position by means of the train itself, and, when in its blocking position, can be rocked from that back again into its normal position by the aid of the next following switch only, but not before the latter has in turn regained its blocking position by the influence of the train as just described.

This system being founded on the basis of a normally closed block, the whole of the signals normally indicate stop or danger. Besides this, the system is provided with distant signals. Signaling is effected by electrical power switched on or off by means of the switches controlled by the train to be protected.

The influence of the train upon the switches is exerted either by means of track current with relays, or by rail contacts, that is to say, this influence is exerted by actuating an electric circuit-closer or an electric contact.

The switch controlling the block to be entered by a train is rocked from its normal position into the blocking position through the action on the contact of the train entering the block in question, whereby the signal protecting the train in the rear is prevented from assuming the "clear" position. Further, the next signal in front of the train and controlling its progress, is moved to "clear," provided the block section ruled by that signal is clear. Finally, the distant signal corresponding to the next following home signal is moved to clear, if the block section ruled by the said home signal is not occupied.

The switch remains in its blocking position irrespective of the train. It is only after the whole train has entered the next block section and has thereby rocked the switch for that section from its normal into its blocking position, thus protecting itself in the rear, that the switch for the section just left is rocked from the blocking position given it by the train when passing through it, back again into its normal position, as the di-

rect and immediate consequence of the next switch having been thrown into its blocking position by the train entering its section, the protecting efficacy of the previous switch being thus cancelled and transferred to the one controlling the occupied section. *In this system, a previous protection (block position), can never be cancelled, before a new one has been created by the train itself in its progress from section to section.*

This purely automatic electrical block system can be used just as well on single-track lines as on double-track lines, likewise within the section of stations of different kinds, protecting the train in both directions. In the same manner, the system will protect and cut off all shunting movements of entire trains or of parts of them from the main track on to the sidings or in the reverse order, and connects all switches to signals.

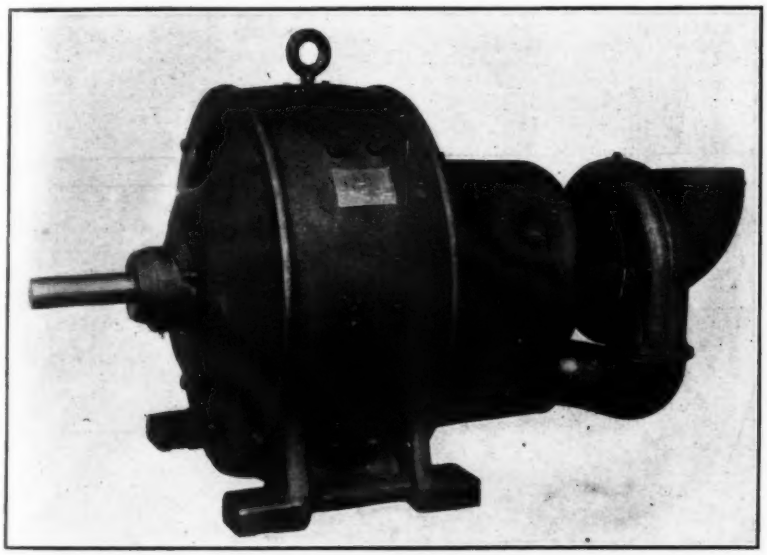
This invention has been elaborated in such a way as to easily allow of the installation of an appliance for *automatically stopping trains* whenever the home signal assumes the "stop" position. The automatic application of air brakes, however, is not an essential feature of the Unverricht-Gossler system. If preferred, the automatic stop device may be replaced by an appliance which does not bring the train to a standstill automatically, but which, by means of a visible or audible indication within the cab of the engine informs the engine driver of the position of the home signals.

In cases where it might not be desirable to adopt all at once the automatic system for setting the signals, the Unverricht-Gossler system may still be used to advantage for controlling the position of the signal-levers as well as that of the switch-levers within the interlocking cabin electrically.

Special Underwriters' Motor.

The Westinghouse Underwriters' motor, illustrated herewith, is designed in accordance with all specifications and requirements of the Chicago Board of Fire Underwriters. Complying as it does with these rigid requirements, the use of this motor to drive fire pumps and sprinkler systems in buildings will materially decrease the insurance rates in most localities.

All joints in the frame are waterproof, and the leads are brought out above the center line so that water can rise to that depth without affecting the operation of the motor. The air outlet can be fitted with a down-turning pipe, and thus prevent falling water from entering the frame. Effective ventilation is obtained by an external blower mounted on the shaft extension. This motor will operate continuously at rated load and voltage with a temperature rise not exceeding 40 degrees centigrade. Excellent commutation is insured by the use of commutating poles. The speed can be increased 10 per cent by shunt-field control. The motor is made for 220 and 500 volts in capacities of 50, 75 and 100 horsepower with a speed of 1,400 revolutions per minute, and 150 horsepower with speed of 1,200 revolutions per minute.



Westinghouse Underwriters' Motor.

The Telephone as an Aid to the Traveling Railroad Office.

The telephone has made it possible for railway officials to have what may be termed a "flying office." This is brought about by the fact that the majority of the private cars in the United States are now equipped with Western Electric telephones, which may be connected at each stopping place to the telephone line by means of a line pole. Over the telephone circuit thus established, the official transacts his routine business as well as takes care of any emergency which may arise. He dictates his memoranda, and even his more lengthy letters, to his secretary or stenographer, who is at headquarters. His private car is his office and without neglecting everyday matters he can make inspections or personally supervise any work, such as clearing up a large wreck, the replacing of a bridge or the clearing of a snowslide or landslide, while keeping his finger upon the "pulse of the road."

In the days before the telephone began to supplant the telegraph for message work on railroads this would not have been possible, for, even if a temporary telegraph circuit had been rigged up, it would have been necessary to employ experienced operators at both ends. This would have meant that a personal message between the general manager and the superintendent would have had to pass through two intervening minds, which would, of course, have detracted from the personal-touch element. This is one of the many points wherein the telephone is vastly superior to the telegraph for use on railway systems.

Electric Propulsion of Canadian Boats.

The Montreal Transportation Company, with offices at Montreal and Kingston, Canada, has decided upon a radical change in its lake, canal, and river fleet. This is the introduction of electrical generating engines into a modernly designed hull.

For some years a New York firm has advocated electrical drive for the Canadian type of freighter, to the development of which it has devoted much time and effort. Accordingly, the fact that a contract was placed in England for such a boat with Diesel engine and Mayor electric gear, after plans and specifications approved by this American firm, is a development of great significance not only to the Canadian trade, but to shipping generally. There will be two high-speed, six-cylinder Diesel engines, each developing about 350 horsepower at 400 revolutions per minute, with their dynamos and exciters, while the propeller shaft will be fitted with special squirrel-cage induction motor for 80 revolutions per minute. One engine can be cut out for adjustment without interfering with the other.

The saving in weight of engine and fuel over steam of the same power runs to about 200 tons, fewer men are required in the engine-room crew, and the valuable space occupied by boilers is available for cargo.

Latest Approved Fittings

BUSHINGS.—Frank Pisch, Jr., Manufacturer, 422 West Forty-ninth Street, New York, N. Y.

Porcelain bushings with special metal cap by which the porcelain piece may be secured to the face of an electric sign or to other similar metal surfaces.

In damp places or where exposed to the weather the metal caps of these bushings should be painted to prevent corrosion.

Approved July 29, 1912.

CUTOUT BASES, CARTRIDGE FUSE.—Mutual Electric & Machine Company, Manufacturer, 57 Eighteenth Street, Wheeling, W. Va.

Cutouts for National Electrical Code inclosed fuses.

All capacities, 250 and 600 volts; slate base.

Approved July 29, 1912.

FIXTURE WIRE.—Standard, National Electrical Code, 1911 Edition.

Fixture wires shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters, and examined at factories and passed by Underwriters' Laboratories, have Laboratory labels attached to each coil.

The following manufacturers are equipped to supply these wires so labeled:

American Steel & Wire Company, Worcester, Mass.

Markings: Soft woolen thread on rubber surface lengthwise of wire and under braid.

Approved August 13, 1912.

Boston Insulated Wire & Cable Company, Dorchester District, Boston, Mass.

Marking: One coarse uncolored thread woven in braid in a counter-clockwise direction.

Approved August 13, 1912.

Safety Insulated Wire & Cable Company, 114 Liberty Street, New York, N. Y.

Marking: Seamless insulation and one yellow thread parallel with the wire between the insulation and the braid.

Approved August 3, 1912.

Standard Underground Cable Company, Westinghouse Building, Pittsburgh, Pa.

Markings: Green thread woven into braid.

FLEXIBLE CORD, PORTABLE.—Driver-Harris Wire Company, Manufacturer, Railroad Avenue and South Fourth Street, Harrison, N. J.

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

Double-conductor cord composed of loosely woven wires with cotton wind, rubber and asbestos insulations, covered with a braid and assembled as a twin or twisted pair, with and without an extra protecting braid over the whole.

Approved July 23, 1912.

OZONATOR FOR AIR.—General Electric Company, Manufacturer, Schenectady, N. Y.

"G.E." Type A-2, Form A; 110 volts, alternating current, 10 watts.

This device consists of an air-cooled, high-tension transformer supplying a number of condensers, all inclosed in

Ozonator, General Electric Company.

an asbestos-lined wooden cabinet mounted on a slate base, together with a controlling switch, fusible cut-out and suitable terminal connection for portable flexible cord.

The full input is less than 250 watts. For use on ordinary lighting circuits.

Approved July 6, 1912.

SWITCHES, FIXTURE.—The Bryant Electric Company, Manufacturer, Bridgeport, Conn.

"Bryant" 3 Amperes, 125 Volts, 1 Ampere, 250 Volts.

Candelabra Candle, Pull, Catalog No. 420.

Standard Candle, Key, Catalog No. 425.

Standard Candle, Pull, Catalog No. 426.

Standard for use only with candle sockets and when installed in a vertical position.

Approved August 12, 1912.

SWITCHES, KNIFE.—Southern Stamping & Die Works, Manufacturer, 928 La Fayette Street, New Orleans, La.

Knife switches, two and three-pole, fused and fuseless, 30 Amperes, 250 Volts.

Approved July 29, 1912.

SWITCHES, PENDANT SNAP.—Benjamin Electric Manufacturing Company, 128 South Sangamon Street, Chicago.

(Two-Button Type.)

Single-pole, 3 amperes, 250 volts, 6 amperes, 125 volts, Catalog No. 3326.

Approved June 5, 1912.

SWITCHES, PUSH - BUTTON FLUSH.—Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

Single-pole, 5 Amperes, 250 Volts, 10 Amperes, 125 Volts, Catalog No. 7201.

Double-pole, 10 Amperes, 250 Volts, Catalog No. 7202.

Three-way, 5 Amperes, 250 Volts, 10 Amperes, 125 Volts, Catalog No. 7203.

Approved August 6, 1912.

SWITCHES, SURFACE SNAP.—Bryant Electric Company, Manufacturer, Bridgeport, Conn.

Ceiling switches with standard pull-socket mechanism. Catalog Nos. 406, 407, 408.

Approved June 13, 1912.

SWITCHES, SURFACE SNAP.—General Electric Company, Manufacturer, Schenectady, N. Y.

"G. E." with Metal Covers.

Three-Way, 1 Ampere, 250 Volts, 3 Amperes, 125 Volts, Catalog Nos. 59875, 60296, 66038.

Three-Way, 3 Amperes, 250 Volts, 5 Amperes, 125 Volts, Catalog Nos. 60954, 60955, 66041.

Three-Way, 5 Amperes, 250 Volts, 10 Amperes 125 Volts, Catalog Nos. 60455, 60456.

Four-Way, 2 Amperes, 250 Volts, 5 Amperes 125 Volts, Catalog Nos. 60458, 60459.

Two-Circuit, 2 Amperes, 250 Volts, 5 Amperes, 125 Volts, Catalog Nos. 60460-60463 inclusive, GE809-GE812 inclusive.

The above types with composition bottom and key attachment, Catalog No. 60598 and key.

Samples of this product have been examined and tested by Underwriters' Laboratories and found in accordance with standard requirements.

Approved June 25, 1912.

Current Electrical News

LIGHTING AND POWER.

(Special Correspondence.)

COLTON, CAL.—Further improvements in the street lighting system will begin about the first of October.

ROLFE, IOWA.—A municipal electric light and power plant is the verdict of the citizens of this place.

CHETEK, WIS.—The Council of this place has before it a petition from the citizens providing for lighting the streets.

LIMA, O.—It has been decided by the City Council that a municipal electric lighting plant will be installed here.

CRISFIELD, MD.—The Electric Light & Power Company will at once rebuild its plant, which was recently destroyed by fire.

DOVER, DEL.—The Iowa City Light & Power Company has been incorporated with a capital stock of $5,000,000.

LAPWAI, IDAHO.—The Lewiston Clarkston Light & Power Company is contemplating extending its lines to the Lapwai Valley.

HUTCHINSON, KANS.—The Commercial Club of this city is interested in seeing the city have an ornamental system of street lighting.

PINE KNOT, KY.—A $3,000 electric light plant is to be erected here by William Cornelius and Daniel Taylor, who have applied for a franchise. G.

VENICE, CAL.—The Pneumatic Power Company has applied for a 50-year franchise to install a water, gas and electric light plant in this city.

HODGENVILLE, KY.—Emmett Smith, of Chicago, Ill., has completed arrangements for the installation of an electric light and power plant at this place. G.

QUINCY, CAL.—The Indian Valley Electric Light & Power Company has applied for a franchise to build a line around Indian Valley, and to other points.

NEWPORT, CAL.—An election has been called for September 10 to vote on the question of incurring a bonded indebtedness in the amount of $25,000 for a municipal light works.

SUMPTER, ORE.—The plant of the Northwest Light & Water Company was damaged by fire to the extent of $10,000, partially covered by insurance. Rebuilding will take place immediately.

ALBANY, N. Y.—The New York & Ontario Power Company has agreed to begin work at once to reconstruct its plant. In all probability the overhead distribution system will be rebuilt.

PORTLAND, ORE.—Articles of incorporation have been filed for the Hurley Hydraulic Transmission Company with a capitalization of $50,000, by W. J. Binns, J. H. Hurley and A. Sweek.

BLACK RIVER FALLS.—It is said that the next work to be undertaken by the committee in charge of resuscitation work being done in this city will be the rebuilding of the power house.

MIDWAY, KY.—Enlargements in the electric light and power plant here are to be made by the Middle West Utilities Company of Chicago, Ill., when the Kentucky property is taken over by the Chicago company. G.

LEHIGH, IOWA.—The City Council has closed a deal with an electric light company to furnish power for lighting this city and it is announced that the work of erecting the city lines will be begun at once.

MONROVIA, CAL.—A contract has been arranged with the Southern California Edison Company which provides for Tungsten lights for Monrovia's portion of the 150 miles of lighted highway in San Gabriel Valley.

MORRISONVILLE, ILL.—William Louis of the Local Electric Light Company will install a larger dynamo, and will build the transmission line to Palmer, a distance of four miles, where he has secured a contract.

CLEVELAND, O.—The Cleveland Electric Illuminating Company has announced that it will build a power sub-station here. This power sub-station is needed to transform the current used in down-town buildings.

BELLE FOURCHE, S. D.—The City Commissioners are making arrangements for a row of ornamental posts bearing cluster lights to be placed on both sides of certain streets in this city to be installed before cold weather.

EPHRATA, Pa.—A vote has been carried in this place to increase the town's indebtedness to $10,000 for the purpose of defraying the cost of installing an additional engine, dynamo and other improvements at the electric light plant.

RIVERSIDE, CAL.—Following the mayor's veto of the bill to place ornamental lights on Seventh and Market Streets, a new resolution has been introduced asking that they be placed in the business and civic parts of those streets.

HUDSON FALLS, N. Y.—The Lake George Highway Lighting Company has been incorporated with a capital stock of $5,000. The directors and incorporators are Charles I. Peabody, John Peterson and Elias Taylor, all of Lake George.

LOUISVILLE, KY.—The Peerless Manufacturing Company will purchase a 40-kilowatt generator in the immediate future. The company has decided to adopt electric power in various processes of manufacturing stamped iron and steel goods and castings. G.

HATTON, N. D.—This city plans to have a "White Way" that will illuminate its business and principal residence streets as well as any of the large cities are lighted. These will be installed as soon as the new electric light plant is in operation.

GALVESTON, TEXAS.—The Houston Electric Company will spend $125,000 on a new power station, additional generating capacity and 84,000 feet of additional feeder and ground returns. Work on the new building for the power station has already been started.

WASHOUGAL, WASH.—The Northwestern Light & Power Company has secured all rights of way for a transmission line to the power dam and work will be pushed forward as fast as possible, and it is expected that power will be distributed along the territory early next year.

PROVO, UTAH.—The Knight Consolidated Power Company has been granted a 21-year franchise to construct and operate an electric pole line over the country roads from pleasant Grove to the north boundary of Provo, and from the Mountains to the Lake.

NEWARK, O.—The American Gas & Electric Company, which has purchased the Newark, Mount Vernon and Lancaster electric light plants, has purchased the old J. E. Thomas foundry site in this city and will erect a $100,000 plant thereon. It is stated that the work of construction will commence at once.

WASHINGTON, PA.—The electricity of this place was completely cut off by the recent flood that destroyed thousands of dollars' worth of property in the city. Lines were immediately put up between Connelsville and the devestated town, and it is now receiving sufficient power from the former plant to light the town.

DOVER, DEL.—The Intercity Power Company, of New York City, has filed articles of incorporation at this place with a capitalization of $10,000,000. The incorporators are Harry M. Deirning and Louis F. Metz, of New York, and James W. Deevy, of Brooklyn. This new company will enter the lighting and power field in New York State.

LOUISVILLE, KY.—The Louisville Lighting Company has completed arrangements to extend its lines to Anchorage, a suburb twelve miles distant from the center of the Falls City and four miles beyond the present terminal of the lighting company at Lyndon. The Louisville Lighting Company is extending service at Beuchel, Jefferson and Middletown as well. G.

YORK, PA.—H. B. Waltman, C. A. Greer and James J. Geery have been granted charters for four electric companies in York County. The companies will have offices in York and each will have a capital of $5,000. The names of the corporations being those of the districts in which they will operate, and are Dover, Manchester, East Manchester and West Manchester.

WACO, TEX.—The city commission has granted the Texas Power & Light Company a franchise for its proposed electric power plant here, requiring of

it a bond of $50,000 that it will fulfill its plans. It is stipulated that the power station shall cost not less than $600,000. It is stated by representatives of the company that its actual cost will be not less than $800,000. It will be located in East Waco, where a site has been purchased. D.

MUSKOGEE, OKLA.—The Muskogee Water Power Company has awarded the contract to Sam P. Brown, Jr., of Chicago, for the construction of a large dam and the installation of a hydro-electric plant of 30,000-horsepower capacity on the Grand River, near here, at a cost of approximately $1,000,000. An auxiliary plant will also be installed by the company on the Illinois river, fifteen miles distant from here. D.

HUNTSVILLE, ALA.—The Alabama Power & Development Company will purchase the Huntsville Railway, Light & Power Company. The development company proposes to bring electric light and power to several cities in Alabama and Tennessee from its plant at Little River Falls and will operate an electric traction line through Decatur, Albertsville, Valhermoso Springs and Huntsville in the immediate future. G.

WINCHESTER, IND.—Articles of incorporation have been filed by the Citizens Heat, Light & Power Company with a capitalization of $400,000. This company proposes to build, equip and operate a large plant for the manufacture of current and to transmit the same and supply light, heat and power to numerous towns and cities surrounding Winchester. The directors are J. T. Moorman, E. F. Klitselman, E. S. Goodrich, G. E. Leggitt, W. E. Miller & C. W. Moore. S.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

SANTA ANA, CAL.—The Pacific Telephone & Telegraph Company has been granted a franchise in this city.

ST. MARIES, IDAHO.—A new telephone exchange to cost $9,000 is to be installed here by the Interstate Telephone Company.

HOME CITY, KANS.—Home City Telephone Company has been incorporated with a capital stock of $10,000 by S. C. Harry and Charles Noller.

LAS VEGAS, N. M.—Improvements that will greatly increase the efficiency of the service of the Western Union Telegraph Company are now under way in the local office.

WAPAKONETA, O.—The Toledo & Ohio Central is arranging to install a telephone system to take the place of the telegraph on the local branch. This has already been done by this company on its Toledo to Columbus line. H.

NEW YORK, N. Y.—Metropolitan Telephone & Telegraph Company has been incorporated with a capital stock of $10,000. The incorporators are C. A. Auer, Brooklyn, N. Y., H. Lee Seller and R. H. Seller, of Montclair, N. J.

IDAHO FALLS, IDAHO.—A representative of the Mountain States Telephone & Telegraph Company has stated that construction work on the rural lines out of Idaho Falls will begin at once.

SPOKANE, WASH.—The Inland Telephone & Telegraph Company has been granted a franchise for a long-distance line to run into the Waverly territory. The system will be used as an addition to the local plant.

PIERRE, S. D.—Articles of incorporation have been filed by the Midway Telephone Company, which has a capital stock of $1,000. The incorporators are Joe Dagher, John Carda, Victor Montague and George Scherer.

GREENVILLE, PA.—The Bell Telephone Company has under consideration a modern telephone system for this place to be installed next summer. This system includes the crankless telephone and lights for the central exchange.

EASTON, PA.—The plans of the Bell Telephone Company to put all of its wires under ground have been approved by the Highway Department, and work will be started immediately. The cost of the work will be $40,000.

NEW YORK, N. Y.—Submarine Wireless Company has been incorporated with a capital stock of $200,000 for the purpose of engaging in submarine telegraphy. The incorporators are Count Laszlo Szechenyi, Felso Erdosor, of Budapest, Austria-Hungary, and Eugene N. Robinson and John M. Russell, of New York City.

ELECTRIC RAILWAYS.

(Special Correspondence.)

PALESTINE, TEX.—The Texas Power & Light Company of Dallas contemplates constructing an electric street railway system here. D.

HUNTINGTON, MASS.—It is said that emergency measures have been agreed upon to construct a trolley line between Lee and this place by January 1.

LOS ANGELES, CAL.—Property owners have agreed to pay the company's share of street paving if the Los Angeles Railway Company puts in a car line on South Main Street, between Thirty-sixth Place and Slauson Avenue.

SANTA BARBARA, CAL.—W. H. Brackerridge, vice-president of the Southern California Edison Company, and H. W. Dennis, chief construction engineer of the company, are going over plans for the construction of the street railway in this city.

CHATTANOOGA, TENN.—The Birmingham & Chattanooga Railroad Company is planning to build an electric railroad between Chattanooga and Birmingham, by way of Boaz, Ala., and Oneonta, Ala. The proposed road will be 177 miles in length. The road will be so constructed as to be used for freight as well as passenger service.

SAN FRANCISCO, CAL.—The Board of Public Works has authorized Secretary Churchill to advertise for bids for the construction of the roadbed and trolley system from Kearny Street down Market to Sansome, where connection is to be made with the outside tracks already there, thus carrying the city's Geary Street road down to the ferries.

DALLAS, TEX.—It is stated by Luther Dean, engineer in charge of the construction of the interurban electric railway of the Southern Traction Company that is to run from Dallas to Waco and Corsicana, that of the 135 miles of roadbed that are involved in the contract more than 75 miles are finished. The contractors are Karney Bros. & Co. Besides the central power station at Waco there will be sub-stations installed at Hutchins, Waxahachie, Hillsbore and Rice. D.

HOUSTON, TEX.—F. S. George, of Dayton, O., representing a syndicate of French people, has finished the preliminary survey for a system of interurban railways that is to be constructed from this city to several towns situated adjacent to the Houston ship channel. The proposed line will run to La Porte, Sylvan Beach, Seabrook, Webster, Friendswood and Pearland. It is stated by Dr. George that all financial arrangements for the early construction of the system have been made. D.

FORT WORTH, TEX.—It is announced by W. E. Brown and associates, who are promoting the construction of an interurban electric railway between Fort Worth and Mineral Wells, a distance of 65 miles, that the Mercantile Trust Company of St. Louis., Mo., has agreed to finance the project provided that $529,000 of the preferred stock of the company that is to be organized to carry out the plans are subscribed by people of Fort Worth, Mineral Wells and other towns and communities along the route. The proposition is meeting with a favorable response. D.

HOUSTON, TEX.—It is announced that the Houston Electric Company, which is a subsidiary of the Stone & Webster Engineering Corporation of Boston, Mass., will make improvements to its street railway system in Houston during the present year at a cost of approximately $1,000,000. Among the improvements will be the construction of a double track on Louisiana and Houston Streets, the reconstruction of the San Felipe, Woodland Heights, Brunner Heights and La Branch lines, and the extension of the system into much new territory which is building up rapidly. David Daly is manager. D.

PROPOSALS.

LIGHTING TRANSFORMERS.—Sealed proposals will be received by the Navy Department, Bureau of Supplies and Accounts, Washington, D. C., until October 1 for furnishing nine transformers to be delivered at the Navy Yard, Philadelphia, Pa., as per Schedule 4823.

TUNGSTEN STREET FIXTURES.—Sealed proposals will be received by the Navy Department, Bureau of Supplies and Accounts, Washington, D. C., until October 1 for furnishing 22 Tungsten street fixtures to be delivered at the Navy Yard, Philadelphia, Pa., as per Schedule 4823.

CRANE.—Sealed proposals indorsed "Proposals for 15-Ton Traveling Crane" will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until September 21 for one 15-ton manually-operated single-trolley traveling crane, 48 feet 11.5-inch span, for the central power plant, Naval Torpedo Station, Newport, R. I. The estimated cost of this crane is $1,800. Plans and specifications may be obtained on application to the Bureau or to the Commandant, Naval Station, Narragansett Bay, Newport, R. I.

FOREIGN TRADE OPPORTUNITIES.

(Parties interested in the following items should address the Bureau of Manufactures, Washington, D. C., and refer to the file number noted.)

No. 9432. CENTRAL CLOCK SYSTEM.—The Consulate General at Vienna reports that bids will be received up to November 30 for a central electric clock system to be installed in that city. A copy of the specifications, in German, is on file in the Bureau of Manufactures and will be loaned to interested parties.

No. 9420. NEW ELECTRIC STREET-CAR SYSTEM AND TUNNELING.—An American consular officer in a European country reports that a municipality has authorized the survey and other preliminary arrangements relative to an unusually extensive urban and suburban electric-car system. In view of the fact that the system will include a tunnel under one of the largest rivers in Europe, mountain railways, bridges, etc., the amount of material, dredging, etc., will be enormous. Negotiations are being carried on with foreign capitalists.

No. 9425. MOTOR TRUCKS, ELECTRIC LIGHTING PLANTS, FURNITURE, ETC.—A report from an American consul in Asia states that one of the leading bankers and steamship owners in that part of the world contemplates a visit to the United States. He is disposed to favor American manufactures and is in the market for motor trucks, and an electric lighting plant.

NO. 9461. ELECTRIC TRAMWAY.—Tenders are invited for a concession for the construction and working for 50 years of an electric tramway between Alajuela and Grecia, Costa Rica, with a branch line to San Pedro de Poas, a total length of 17 miles. The estimated cost of constructing the tramway is placed at about $500,000. The estimated cost of a hydroelectric power plant on the Poas River for operating the system is $300,000. All material required for the construction and equipping the undertaking will be imported free of duty, and the government guarantees interest, from the date the tramway is opened for a period of 25 years, at the rate of six per cent per annum on the capital invested up to 1,000,000 colons (about $465,000). Further particulars and plans may be obtained from the Direccion General de Obras Publicas, San Jose, for 25 colons ($11.63).

NEW INCORPORATIONS.

CHICAGO, ILL.—The Parker Motor Company has been incorporated with a capital stock of $5,000. The incorporators are Hugo W. Schnetzky, Frederick D. Parker, and Archie E. Cole. Z.

NOCONA, TEX.—The Nocona Ice & Light Company has been incorporated with a capital stock of $15,000 by W. D. Carmichael, C. H. Dodson and H. I. Weathers.

CHICAGO, ILL.—The governor of Delaware recently granted papers of incorporation to the Chicago Suburban Gas & Electric Company, of this city, which has a capital of $6,000,000. N.

HILBERT, WIS.—The Auto Electric & Gas Lighting Company has been incorporated with a capital stock of $10,000. The incorporators are W. E. and Catherine Bishop, and J. W. Grupe and Hilda Grupe. Z.

CHICAGO, ILL.—The Herwig Art Shade & Lamp Company has been incorporated with a capital stock of $5,000 to sell gas and electric fixtures. The incorporators are H. H. Sadler, O. H. Hensel, and Carl Neuburger. Z.

CHICAGO, ILL.—The Jones Manufacturing Company has been incorporated with a capital stock of $10,000 to sell gas and electric fixtures. The incorporators are H. B. Silverberg, H. J. Rosenberg, and H. B. Perlman. Z.

NEW YORK, N. Y.—The firm of E. May, Incorporated, has been incorporated with a capital stock of $1,000 for the purpose of engaging in a general electrical contracting business. The incorporators are John Potts, Edward May and William Nichols, all of Brooklyn.

FINANCIAL NOTES.

Interests said to be allied with the Conowingo Power Company, a company incorporated under the laws of Maryland and operating in Pennsylvania and which plans to erect a dam on the Susquehanna River, have bought up the Lancaster, Oxford and Southern Railroad, which runs through Lancaster county to Oxford and then to the Susquehanna. It was bought at a receiver's sale by bondholders for $50,000. The price paid by Conowingo people was $52,000. Along with the road goes valuable ferry rights.

The Bay State Street Railway Company has sold the $2,000,000 five-per-cent serial notes, which it has issued for the purpose of funding floating indebtedness, to a syndicate comprising Perry, Coffin & Burr, N. W. Harris & Company, and Merrill, Oldham & Company.

It is reported that a deal is pending for the sale of controlling interest in the Merchants' Heat & Light Company, of Indianapolis, Ind., to a syndicate of Louisville, Ky., business men. Henning Chambers, of the brokerage firm of Henning Chambers & Company, Louisville, and L. H. McHenry, who has represented H. M. Byllesby & Company in several Kentucky deals, are negotiating for controlling interest in the Indianapolis company's outstanding capitalization of $500,000 in common stock and $150,000 in preferred stock. It is understood in Louisville financial circles that a public utility syndicate is being formed by Messrs. McHenry and Chambers and John W. Barr, Jr., president of the Fidelity Trust Company, and other capitalists, to operate the Indianapolis and other properties.

The newly chartered Valley Railways Company, which was organized under the laws of Pennsylvania a few months ago, with nominal capitalization of $10,000, has been authorized to increase its capital stock to $2,000,000. It is understood that this company will take over the Valley Traction Company and possibly the Central Pennsylvania Traction Company. The Valley Traction Company has outstanding an issue of bonds amounting to $1,600,000 and the company has been authorized recently to increase this amount to $4,200,000. It is understood that a blanket mortgage will be filed within a few days to furnish security for the new bond issue.

European banking houses are now taking over quite an amount of securities of hydroelectric companies operating in California. In addition to the announcement that European bankers have underwritten the bonds of the Southern California Utility Company and the San Diego, Riverside & Los Angeles Railroad Company, comes the news that Swiss bankers have taken $500,000 of debenture notes of the Northern California Power Company, Consolidated. The notes, which are dated July 1, 1912, and payable July 1, 1917, have been approved by the California Railroad Commission. They bear six-per-cent interest and are callable at any interest date prior to maturity at a premium of one-half to one-per-cent for each year remaining until maturity.

Harris, Forbes & Company are offering for sale $234,000 of the five-per-cent gold refunding bonds of the Scranton Electric Company, Scranton, Pa. These bonds are dated July 1, 1907, and are due in 30 years. They may be redeemed on any interest date after 1912 at 110 and accrued interest. The Scranton Electric Company is a consolidation of several companies, controlling the entire electric light and power business of that city and adjoining towns. It is estimated that the company at the present time serves a population of about 225,000, which is increasing each year. These bonds are secured by a first mortgage on the entire property of the company, subject to a prior claim of only $21,000, which represents the bonds outstanding on constituent companies. Provision is made in the mortgage for an annual sinking fund of two per cent of the total amount of the bonds.

The first step toward the financing of the Long Acre Electric Light & Power Company, which is about to enter New York as an active competitor in the electric light and power field, now occupied exclusively by the Edison Company, was taken when articles of incorporation were filed at Dover, Del., for the Intercity Power Company of New York City, with an authorized capital of $10,000,000.

The objects and purposes, as specified in the charter, include the manufacture and generation, the leasing, using, producing, furnishing and supplying of electricity, or any other force or power in any form whatsoever for any and all purposes. The real interests behind the new company are Harvey Fisk & Sons, the bankers who financed the Hudson tunnels and are closely allied with J. P. Morgan & Co. John C. Sheehan is a large holder of the stock of the new company, and it is generally believed that Richard Croker, who still owns a large interest in the Manhattan Transit Company, whose broad charter he obtained, is heavily interested in the new enterprise.

Wall Street heard a report that the scheme is a much more important one than appears on the surface. According to this report the Interborough Rapid Transit Company may, through the valuable charter owned by the Long Acre Electric Light & Power Company, become a distributer of electric light and power throughout the greater city, thus making use of the conduits with which its subways are lined. The new company will take over the Long Acre concern, whose entire capital stock is owned by the Manhattan Transit Company, exchanging its stock share for share. The Long Acre Company has recently entered into a long contract with the Hudson Tunnels by which the power houses of the latter enterprise are to sell their surplus current to the Long Acre Company. The two concerns will build a new power house on the Hackensack Meadows and extend their electric light wires to Newark, Jersey City, Elizabeth and nearby Jersey towns.

Control of the Pacific Gas & Electric Company of Phoenix, Arizona, has been acquired by Viele, Blackwell & Buck, New York City, and various extensions and improvements will be made to the property. As yet no announcement has been made as to its ultimate destination, but it probably will become a part of a large holding corporation. This company has no connection with the Pacific Gas & Electric Company of San Francisco, but was organized several years ago to take over the Phoenix Gas Company and to distribute electric power generated at the Roosevelt dam. It has a capitalization of $363,500 common, and

$400,000 five-per-cent preferred stock, with $525,000 five-per-cent bonds. Plans are being made for extensive enlargement of electric power facilities from the Roosevelt dam, and it may be that the changing of control of the Pacific Gas & Electric has something to do with these. Mines in the district have closed contracts for large amounts of current, and the control of the present company passing into the hands of such well known hydroelectric engineers is being taken as a part of a vast plan for utilizing the great amount of waterpower made available by the construction of the big Government dam and irrigation project.

New York houses interested in public utility projects in California have received word that a European syndicate, composed of British and continental bankers, has underwritten the bond issues of the Southern California Utility Company and the San Diego, Riverside & Los Angeles Railway Company. Southern California Utility has $10,000,000 25-year five-per-cent bonds authorized and $1,000,000 stock. It was organized to take over a number of land, irrigation, water and power properties in Southern California. Its holdings are chiefly made up of land and water rights and power production. The San Diego, Riverside & Los Angeles Railway Company, owned by the same interests, has $8,000,000 bonds and $8,000,000 stocks. Its projected lines are to be installed for use of steam, but its charter gives it the right to change to electric power. The road is designed to assist in the development of the land and water rights owned by the Southern California Utility Company.

Dividends.

The Fort Wayne & Northern Indiana Traction Company, quarterly dividend of 1.5 per cent on the preferred stock, payable September 3 to stock of record August 22.

Chicago Telephone Company, quarterly dividend of 2 per cent, payable September 30 to stock of record September 21.

Brooklyn Rapid Transit Company, regular quarterly dividend of 1.25 per cent, payable October 1 to stock of record September 9.

Chippewa Valley Railway, Light & Power Company, quarterly dividend on the preferred stock of 1.74 per cent, payable September 1 to stock of record August 31.

Tennessee Railway, Light & Power Company, quarterly dividend of 15. per cent, payable September 3 to stock of record August 20.

Reports of Earnings.

NEW YORK TELEPHONE COMPANY.

The New York Telephone Company reports to the New York Stock Exchange for the six months ended June 30, 1912, as follows:

Telephone revenue	$21,050,641
Expenses and taxes	15,215,751
Net telephone earnings	5,834,890
Dividends and interest	2,345,866
Miscellaneous earnings	5,137
Total net earnings	8,185,893
Interest charges	1,254,781
Balance	6,931,112
Dividends	5,000,000
Surplus	1,931,112

THE COLUMBIA RAILWAY, GAS AND ELECTRIC COMPANY.

The Columbia (S. C.) Railway, Gas & Electric Co. reports gross earnings of $52,445 for June, 1912, a gain of $7,513 over June, 1911. For the six months ended June 30, 1912, the gross earnings of the company were $325,188, an increase of $43,002 over the first six months of 1911.

THE WASHINGTON, BALTIMORE AND ANNAPOLIS ELECTRIC RAILWAY COMPANY.

The Washington, Baltimore & Annapolis Electric Railway Co., reports as follows for July, 19.2, and the seven months ended July 31, 1912:

	1912	1911	Changes
July gross	$65,932	$60,143	inc. $5.789
July net	33,460	29,795	inc. 3,665
July other income	663	314	inc. 349
July income	34,123	30,108	inc. 4,015
July net income.	11,306	7,737	inc. 3,569
7 months' gross	436,948	384,543	inc. 52,405
7 months' net	215,734	183,677	inc. 32,057
7 mos. other inc.	3,434	7,464	dec. 4,030
7 mos. income.	219,169	191,142	inc. 28,027
7 mos. net income	63,130	10,720	inc. 52,410

The increase in earnings of the Washington, Baltimore & Annapolis has caused an advance in both the bonds and preferred stock of the company. Since the reorganization, which materially cut down fixed charges, net income has been showing handsome increases.

THE MONONGAHELA VALLEY TRACTION COMPANY.

The Monongahela Valley Traction Company, in its July statement, shows gross earnings of $79,821, as compared with $68,332 in the same month last year. The net surplus, however, shows a decrease, being $22,670, as compared with $27,817 in 1911. This increase is on account of the growth of the item of fixed charges and taxes, which increased from $17,071 for July in 1911, to $25,332 in 19 2. The statement for the seven months of the current year up to August 1 is as follows:

	1912	1911	1910
Gross earnings	$466,845	$404,657	$327,263
Oper. expenses	190,960	141,110	119,908
Net earnings	275,885	263,546	207,354
Fixed charges, taxes and insurance	138,439	112,135	87,904
Net surplus	137,446	151,410	119,450

THE MICHIGAN LIGHT COMPANY.

The Michigan Light Co., all of the stock of which is owned by the Commonwealth Power, Railway & Light Co., reports earnings for July, 1912, and the seven months ended July 31, 1912, as follows:

	July	Gain %	7 Months	Gain %
Gross earnings	$101,777	12	$786,128	10.5
Net earnings	43,594	18.4	341,062	12.8
Net income	27,424	29	228,219	18
Preferred dividends	10,720	..	75,040	..
Surplus	16,704	58.7	153,179	29.4

For the twelve months ended July 31, 1912, gross earnings were $1,376,196, an increase of 7.5 per cent over the preceding twelve months. The net earnings for the same period were $619,104, an increase of 11.5 per cent, with net income of $430,364, a gain of 15.4 per cent. The balance available for common stock dividends and replacement charges after preferred dividends, was $301,724, a gain of 23.6 per cent over that for the twelve months ended July 31, 1911. This balance compares with one of $266,885 for the year 1911, and $239,101 for the year 1910.

AURORA, ELGIN AND CHICAGO.

July gross	$192,754	$186,271	$182,387	$167,614
Net after tax	90,458	90,782	94,775	89,719
Sur. aft. chgs.	57,154	58,258	62,206	60,820

INTERBOROUGH RAPID TRANSIT.

The earnings of the Interborough Rapid Transit Company for the month of July compare as follows:

	1912	1911	Changes
		Inc.	
Gross	$2,267,409	$2,087,729	$179,680
Net after taxes	1,043,307	911,387	131,920
Other income	27,005	25,817	1,188
Total income	1,070,312	937,204	133,108
Sur. aft. chgs.	151,276	40,235	111,041
Passgrs. car	44,056,991	40,409,268	3,647,723

THE UNION RAILWAY, GAS AND ELECTRIC COMPANY.

The Union Railway, Gas & Electric Company, which controls quite a number of operating companies in the middle West, reports through Hodenpyl, Hardy & Co. as follows:

	July	7 Mos.	12 Mos.
Gross earnings	$330,433	$2,081,752	$3,508,475
Oper. expenses	185,065	1,182,802	1,930,184
Net earnings	145,368	898,950	1,578,290
Fixed charges	102,396	566,332	926,992
Net profits	42,971	332,618	651,298

On July 1, 1912, the Evansville Light Company, all of whose capital stock is owned by the Union Railway, Gas & Electric Company, acquired the common capital stock of the Public Utilities Company, which company in turn acquired the stocks of the Evansville Gas & Electric Light Company, the Evansville Public Service Company, and also the title to the railway properties formerly owned by the Evansville Southern Indiana Traction Company.

COMMONWEALTH POWER, RAILWAY AND LIGHT COMPANY.

Hodenpyl, Hardy & Company has issued the following statement of earnings for the Commonwealth Power, Railway & Light Company, which is the holding company for quite a number of utilities in Michigan:

	Month	7 Mos.	12 Mos.
Gross earnings	$520,701	$3,497,031	$5,950,394
Oper. expenses	276,680	1,847,770	3,135,550
Net earnings	244,021	1,649,260	2,814,844
Fixed charges	171,692	1,051,988	1,710,093
Net profits	72,329	597,271	1,104,750
Did. pfd. stock	30,000	210,000	360,000
Balance	42,329	387,271	744,750

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Aug. 31.	Aug. 24.
Allis-Chalmers common (New York)	...	...
Allis-Chalmers preferred (New York)	*1⅛	5½
American Tel. & Tel. (New York)	144½	145¼
Commonwealth Edison (Chicago)	139½	139
Edison Electric Illuminating (Boston)	...	...
Electric Company of America (Philadelphia)	...	12¼
Electric Storage Battery common (Philadelphia)	57	56⅞
Electric Storage Battery preferred (Philadelphia)	...	...
General Electric (New York)	182½	182
Kings County Electric (New York)	...	...
Manhattan Transit (New York)	*2¼	2⅛
Massachusetts Electric common (Boston)	18½	18¾
Massachusetts Electric preferred (Boston)	77	77
National Carbon common (Chicago)	118	116
National Carbon preferred (Chicago)	117½	117¼
New England Telephone (Boston)	...	...
Philadelphia Electric (Philadelphia)	23⅝	23⅝
Postal Telegraph and Cables common (New York)	...	...
Postal Telegraph and Cables preferred (New York)	...	...
Western Union (New York)	81½	81½
Westinghouse common (New York)	87¾	87½
Westinghouse preferred (New York)	...	...

*Last price quoted.

PERSONAL MENTION.

J. C. WATSON, of Chattanooga, has been appointed to take charge of the new electric light and power plant at Pulaski, Tenn.

JOSEPH B. BAKER has associated himself with Rickard & Sloan, New York City, in their work of "productive publicity." His address hereafter will be 20 Vesey Street.

STANLEY J. GODDARD, president of the Constantinople Telephone Company, and W. W. COOK, consulting engineer, left London on August 24 on a visit to Constantinople.

R. J. DINWOODEY, formerly with the Capital Electric Company, Salt Lake City, Utah, is now associated with the Inter-Mountain Electric Company, Salt Lake City, in the sales department.

WILLIAM B. WHITEHORN, who has been purchasing agent for the Omaha Electric Light & Power Company, Omaha, Neb., has been appointed assistant to President F. A. Nash.

JOSEPH B. McCALL, of the Philadelphia Electric Company, has been appointed a member of the committee to help re-elect President Taft, named by the Union League of Philadelphia.

HILSON WARFIELD has become a member of the New Business staff of the Louisville Lighting Company, Louisville, Ky. Mr. Warfield has for several years been manager of the sales department of the City Electric Company, of Hopkinsville, Ky.

JOHN McGINNESS, of Erie, Pa., has been appointed manager of the Easton, Pa., District of the Consolidated Telephone Companies. Mr. McGinness succeeds the late William Reeser, who died of heart trouble at his home in Easton.

WILLIAM M. SCOTT, of the Cutter Electric Manufacturing Company, of Philadelphia, was recently appointed a member of the Tuskegee Normal and Industrial School at Tuskegee, Ala. Mr. Scott has had a long service with the Cutter Company and is now its treasurer.

JAMES W. HARRISON, of Walhalla, S. C., has been appointed manager of the Colleton County Telephone Company. Mr. Harrison is a graduate of the electrical and engineering course of Clemson College and has for the past year been assistant director in the Electrical Department, and has been in charge of the power plant and the electrical and telephone systems at the college.

GEORGE H. HARRIES, president of the Louisville Lighting Company, Louisville, Ky., and general manager of the Minneapolis Electric Company, Minneapolis, Minn., has returned to Louisville after a five-day campaign in the District of Columbia. General Harries is commander of the District National Guard, and had charge of one of the contending forces in the sham engagement which was carried on.

J. G. POMEROY has resigned his position as sales manager of the Adams-Bagnall Electric Company, Cleveland, O., to take effect October 1, 1912. Mr. Pomeroy has been connected with the company for 17 years. Until a little over a year ago he was manager of the Western office, located in Chicago. "Jim" Pomeroy is one of the best beloved and most highly respected men in the electrical industry. His friends are legion, and they will be glad, indeed, to know that he will take a well-earned rest, spending three or four months in Southern California. Following that he has not made any definite plans for the future, but it is expected that he will resume his well-known activity and that we will hear from him again.

E. C. DEAL was elected president of the Georgia Section of National Electric Light Association at its recent annual convention. Mr. Deal is general manager of the Augusta-Aiken Railway & Electric Corporation, of Augusta, Ga. He started his electrical work with the Georgia Electric Light Company in Atlanta and afterwards became connected with the Stone & Webster Corporation. In 1904 he was connected with the Bergen County Gas & Electric Company and afterwards joined the Public Service Corporation of New Jersey. He later became general manager of the North Carolina properties of W. N. Coler & Company, and in 1911 joined the J. G. White Company in his present position. Mr. Deal is a member of the American Street Railway Association, the American Gas Institute and a number of local commercial and social organizations. He has been active in the National Electric Light Association for many years and will no doubt lead the Georgia Section through a year of success and prosperity. The Section will shortly change its name to the Southeastern Section and comprise in its membership the territory of five states.

OBITUARY.

ROBERT H. M. BOSANQUET, fellow of St. John's College, Oxford, England, known for his researches in magnetism, died on August 7, aged seventy-one years.

HAROLD GAY died suddenly on August 25 at Farmington, Conn. Mr. Gay was supervising engineer in the construction of the power house at North Adams, which supplies the Hoosac Tunnel, and was engaged in other engineering work for L. B. Stillwell. Prior to his association with Mr. Stillwell he was connected with the Engineering Department of the General Electric Company.

ARTHUR DANA WHEELER, a prominent lawyer of Chicago and for five years president of the Chicago Telephone Company, died suddenly of angina pectoris at his home, Lake Forest, Ill., on August 29. Mr. Wheeler was born at Kenosha, Wis., in 1861 and was educated in the public schools and Lake Forest University. He came to Chicago in 1882, taking up the study of law at the Northwestern University Law School. He entered into active practice in 1884, joining the law firm of Williams & Thompson two years later; this firm was subsequently changed to Williams, Holt & Wheeler and later to Holt, Wheeler & Sidley. While representing the Chicago Telephone Company as counsel, Mr. Wheeler became its second vice-president and in May, 1903, was elected to its presidency. In 1908 he resigned this office to become chairman of the company's board of directors, in which position he continued till his death. He was also a director of the Central Union Telephone Company, of the Western Electric Company and of other companies. He was a member of some half dozen clubs and took a deep interest in church and civic welfare work. The funeral services were held at Lake Forest on September 1 and interment was at Kenosha.

NEW PUBLICATIONS.

HOLLAND BOARD OF PUBLIC WORKS.—The annual report of the Board of Public Works of Holland, Mich., for the year ended March 20, 1912, has now been published. It gives the reports of the two water works, one of which contains an electrically driven pump, and of the municipal electric light plant. A third pumping station to contain two motor-driven centrifugal pumps is under construction.

WHITE RIVER DEVELOPMENT.—The Stone & Webster Engineering Corporation, Boston, Mass., has issued a very attractive 24-page brochure describing with the aid of many illustrations the new hydroelectric power development on the White River in the Puget Sound district of Washington. The cover design is craftily done in colors to give the appearance of an embossed bird's eye view of the project. The printing of the inner pages with two or three impressions so as to give the effect of a crimpled border is both novel and artistic. A large number of fine half-tone and line illustrations show the scope and progress of the construction work.

DATES AHEAD.

Eighth International Congress of Applied Chemistry. New York, N. Y., September 6-13.

American Electrochemical Society. Fall meeting in conjunction with Electrochemical Section of International Congress, New York, N. Y., September 7, 9 and 10.

Association of Edison Illuminating Companies. Annual convention, Hot Springs, Va., September 10-12.

Vermont Electrical Association. Annual convention, Rutland, Vt., September 12-13.

Illuminating Engineering Society. Annual convention, Hotel Clifton, Niagara Falls, Ont., September 16-19.

Association of Iron and Steel Electrical Engineers. Annual convention, Hotel Pfister, Milwaukee, Wis., September 23-28.

The 1912 Boston Electric Show, Mechanics' Building, Boston, Mass., September 28 to October 26.

American Electric Railway Association and its five affiliated associations. Annual convention, Chicago, Ill., October 7-11.

Electric Vehicle Association. Annual convention, Boston, Mass., October 8.

Railway Signal Association. Annual meeting, Quebec, Can., October 8-11.

The New York Electrical Exposition and Automobile Show. The New Grand Central Palace, New York City, October 9-19.

New England Section of the National Electric Light Association. Fall meeting, Boston, Mass., October 15-17.

Sons of Jove. Annual convention, Pittsburgh, Pa., October 14-16.

Indiana Electric Light Association. Annual convention, Indianapolis, Ind., October 16-17.

Kansas Gas, Water, Electric Light and Street Railway Association. Annual meeting, Manhattan, Kas., October 17-19.

Association of Railway Electrical Engineers. Annual convention, Chicago, Ill., October 21-24.

Old Time Telegraphers' and Historical Association and the Society of the United States Military Telegraph Corps. Annual convention, Jacksonville, Fla., October 22-24.

With the Electrical Manufacturers

Keuffel & Esser Company, 127 Fulton Street, New York, N. Y., has issued two circulars describing its unique measuring tapes and pocket magnetic compasses.

Kerr Turbine Company, Wellsville, N. Y., has issued Bulletin No. 26, illustrating and describing its new Economy steam turbine. Photographs of actual installations are shown, interesting steam-consumption curves are given and size comparisons are made. A copy will be mailed to anyone interested upon request to the company.

The Electric Storage Battery Company, Philadelphia, Pa., on the occasion of the naval pageant held in Chicago from August 10 to 18, aided the committee in charge by the loan of 58 cells of Exide battery. These were used for supplying 72 electric annunciators by means of which the various races and other events were announced to the 15,000 persons on the special grand stand built on the Government Pier.

McEwen Brothers, Wellsville, N. Y., have issued Bulletin No. 2, devoted to the turbine-driven blowers manufactured by this firm. These blowers are made with two types of runners, helical and propeller, both particularly suited for high-speed steam-turbine drive. This bulletin also contains data and performance curves showing the advantage of using blowers having economical speeds in common with those of the driving turbines.

Beardslee Chandelier Manufacturing Company, Chicago, is sending out new fixture-design sheets with its monthly *Beardslee Talks*. A recent number calls attention to the new method of pricing followed on these sheets which is a great convenience to the fixture dealer, since the net price is given without reference to separate price or discount lists. The desirability of distinctive show-window displays and of clean, neat catalogs is also pointed out.

Cooper Hewitt Electric Company, Hoboken, N. J., has issued Bulletin No. 44 on the new Cooper Hewitt quartz lamps. These lamps are mercury-vapor lamps in which the luminous tube is made of pure quartz, thus permitting higher temperatures and improved efficiency. The lamps are for direct-current circuits only. The bulletin describes both type Y and type Z lamps, the former being for 110 and the latter for 220-volt lines. They can be used for either indoor or outdoor use.

The American Conduit Manufacturing Company, Pittsburgh, Pa., is distributing a very useful and practical pocket souvenir. This is printed on celluloid and gives a complete rigid conduit price list, including the size, price per hundred feet, price of elbows per hundred, price of couplings per hundred, actual dimensions and nominal inside dimensions, number of threads per inch of screw, nominal weight per foot in pounds, radius and offset dimensions of elbows, and the net prices per 100 feet at various discounts.

The Independent Lamp & Wire Company of New Jersey, 1733 Broadway, New York City, announces that it has purchased all of the assets, including good will, of The Heany Company, The Heany Lamp Company and The Heany Fire-Proof Wire Company, and has assumed all uncompleted contracts undertaken by them. It will maintain and operate the works at Weehawken, N. J., and York, Pa. The scope of manufacture will be extended to include the type of tungsten lamps covered by the Karl Farkas patents

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued folder No. 4230, entitled "How Westinghouse Small Motors Can Help You." This is a very attractive little publication describing with illustrations some of the manifold uses to which small electric motors can be put. The views show actual installations of the small motors in the home and in the shop. The publication is intended for dealers and central stations, space being left for their name on the book.

Nelite Works of General Electric Company, Cleveland, Ohio, has begun the publication of a monthly house organ entitled *Illumination Progress*. The first number (August) is full of interesting articles attesting to the value of good illumination in the factory, store and school. A number of new products are also illustrated and described; among these are Realites, Urnolites, Xtraficiency reflectors and Rockford table lamps. The illustrations and typography are excellent and the indications are that the new monthly will be valuable to all who have light or lighting fixtures to sell.

Cutler-Hammer Clutch Company, Milwaukee, Wis., has issued Bulletin No. 12,000 devoted to circular-type lifting magnets. This is a 48-page book replete with illustrations of the many applications of these magnets. Their construction is described with the aid of diagrams and photographs and their ruggedness, serviceability and economy pointed out. The latter feature is verified by the results of numerous tests and reports, all of which show strikingly the great labor, time and money-saving properties of the lifting magnet in handling all kinds of pig and scrap iron, castings, structural and other rolled iron, ingot butts and, in fact, anything of, or containing, iron.

The Hess-Bright Manufacturing Company, Philadelphia, Pa., has moved its office from Twenty-first Street and Fairmount Avenue to the new factory at the southeast corner of Front Street and Erie Avenue. The new location affords ground and floor space for a much needed extension. The new factory embodies the latest ideas in up-to-date construction and arrangements.

Western Electric Company, New York, N. Y., has issued Bulletin No. 74 which replaces former Bulletin No. 9780. This is a catalog of outside construction material, including poles, cross-arms, pins and various accessories for pole work, cable splicing joints and other cable accessories, hangers, etc., and Orangeburg fiber conduit.

General Electric Company, Schenectady, N. Y., has issued a number of new publications. Bulletin No. 4973 illustrates and describes its resistance units for various motor-starting and speed-controlling rheostats.—Bulletin No. 4975, which is a revision of a former bulletin, is devoted to the synchronism indicator.—Bulletin No. 4977 describes the control apparatus known as type *MK*, which is designed for use where single-car operation predominates, and where a uniform acceleration is not of such importance as extreme simplicity.—Bulletin No. A4001, describes oil switches which are intended primarily for use in small and isolated alternating-current plants of voltages not greater than 3,300. The bulletin contains connection and dimension diagrams, and also useful formulas for use in selecting oil switches. —Bulletin No. A4002 describes polyphase maximum watt demand indicator, type *W*. This instrument is suitable for recording the maximum load of alternating-current circuits irrespective of power-factor and voltage fluctuations.

The Wurdack Electric Manufacturing Company, St. Louis, Mo., has recently secured, among other contracts, the following: City of St. Louis, Fire Alarm and Police Telegraph Department, switchboard, instruments, etc., for operating room; Rice Hotel, Houston, Tex., panelboards and switchboard (contract placed through Wm. A. Carroa & Company, St. Louis). The company has also secured contracts for installing switchboards and panelboards in the Commonwealth Trust Building, Dallas, Tex.; the Cotton Hotel, Houston, Tex.; M. K. & T. Building, Dallas, Tex.; Southwestern Life Insurance Building, Dallas, Tex.; Grand Opera House, St. Louis; Fort Mott, N. J.; Minneapolis High School, Minneapolis, Minn. The company has also secured the contract for a complete panelboard installation from the National Lead Company, New Kensington, Pa., and an order for the panelboards in 18 buildings of the Cincinnati General Hospital, Cincinnati, O. Through the Guarantee Electric Company, of St. Louis, the company has secured the contract for panelboards and switchboards in the Adolphus Busch residence in St. Louis County, Mo. This installation will be one of the finest in the country, as every known appliance that can be handled electrically will be used.

Record of Electrical Patents.

Issued by the United States Patent Office, August 27, 1912.

1,036,548. Electric Lamp Socket. C. H. Bissell, assignor to Crouse-Hinds Co., Syracuse, N. Y. A weatherproof receptacle made of a single piece of porcelain with a socket at the bottom and an overhanging cap.

1,036,551. Electric Light Socket. T. A. C. Both, assignor to I. S. Rosenheim, New York, N. Y. The line wires pass through transverse apertures that act as strain relievers.

1,036,552. Truck Construction and Insulation. A. L. Bower, Boyertown, Pa. The car platform is insulated from the truck.

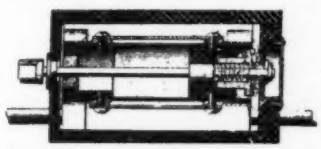
1,036,554. Electrolytic Cell. F. H. Briggs, Elyria, O. The electrolyte container may be lowered or raised without disturbing the electrode supports.

1,036,571. Electrodeposition of Metals. J. A. Corey, Datchet, England. The cathode carrier rotates in the vat.

1,036,576. Attaching Rubber to Metals. L. Daft, Rutherford, N. J., assignor to Electro-Chemical Rubber & Manufacturing Co. The article is electroplated in an electrolyte containing antimony, zinc and copper and rubber is vulcanized on the surface formed.

1,036,596. Centrifugal Mercury Cut-out Switch. F. E. Fisher, Detroit, Mich. A horizontal shaft has a transverse mercury chamber with a pair of opposite electrodes.

1,036,597. Battery Box. H. M. Fisk, Watseka, Ill. Spring connectors on the cover connect the dry cells in series.



1,036,657.—Snap-Switch Multiple Fuse.

1,036,605. Welding Machine. H. Geisenhöner, assignor to General Electric Co. One of the electrodes is in the form of a gear with blunt teeth that are rotated over the work.

1,036,612. Press Plate. W. S. Hadaway, Jr., assignor to Westinghouse Electric & Manufacturing Co. Has a number of interchangeable metal-clad resistance units clamped between parallel rods in a flat box.

1,036,616. Automatic Draft-Regulator for Steam-Boiler Furnaces. F. W. Harrington, assignor to W. K. Logee, Providence, R. I. The fire door operates a switch that shuts down the electric blower when the door is open.

1,036,620. Electric Signaling System. K. A. Hawley, assignor to Simmen Automatic Railway Signal Co., Los Angeles, Cal. A danger signal is controlled by differential action of two circuits.

1,036,626. Wire-Puller or Come-Along. D. W. House, Chicago, Ill. Has a cam-like wire grip on one face and a double handle at the narrow end.

1,036,632. Electric Heating Pad. G. Jahr, Berlin, Germany. Has very fine and pliable resistance wire woven in among the threads of the fabric.

1,036,645. Change-Making Apparatus. E. N. Kleinbaum, Brooklyn, N. Y. Has electrically operated coin ejecters for the coin-stacker tubes of different denominations.

1,036,654 and 1,036,655. Anode Support. C. E. Leffel, assignor to Spirella Co., Meadville, Pa. The first patent describes an anode-holding hook and the second a supporting cross-head.

1,036,657. Snap-Switch Multiple Fuse. N. E. Lemmon, Chicago, Ill. In a rotary cylinder a number of fuse strips terminate on commutators at the ends on which rest brushes so that each fuse can be connected in after the preceding one has blown.

1,036,676. Electric-Lamp Fixture. W. I. Miller, Cleveland, O. A flexible bracket arm made of jointed tubular sections.

1,036,688. Motor Control. W. Neumann, assignor to General Electric Co. A reversible motor with two series fields, one for each direction, can have one of them short-circuited while the other forms a braking circuit with the armature.

1,036,696. Transformer Cutout for Alternating-Current Circuits. J. S. Peck, assignor to Westinghouse Electric & Manufacturing Co. A main and an auxiliary transformer cannot be interconnected until there is excess load.

1,036,700. Combined Circuit-Breaker and Distributer. C. A. Pfanstiehl, Highland Park, Ill. For use with the igniter of an internal-combustion engine.

1,036,707. Apparatus for Displaying Advertisements. M. E. Pudney, Finsbury Park, England. An electric motor drives endless bands carrying advertisements.

1,036,723. Electrical-Circuit Protector. C. A. Rolfe, assignor to F. B. Cook, Chicago, Ill. A heat cartridge for use on telephone terminal boards.

1,036,724. Keyboard Contact. C. E. Rowe, Cortland, N. Y. The keys connect between a common conductor and individual contacts.

1,036,739. Hanger for Supporting Incandescent Lamps. C. Sorensen, Racine, Wis. The fixture has a universal joint at the top.

1,036,742. Automatic Engine Stop. L. P. Strong, assignor to Clark Manufacturing Co., Cleveland, O. Has a latch controlled by a normally open electric circuit.

1,036,744. Incandescent Electric Lamp. E. H. Tate, Los Angeles, Cal. The filament-supporting stem is a hollow cone connected to heat-discharging openings in the hollow base.

1,036,753. Train-Stopping Device. E. Unverricht, Hamburg, Germany. A conductor on the first trip governs an electromagnetic lock for the second trip.

1,036,754. Controller for Electric Motors. T. Varney, assignor to Westinghouse Electric & Manufacturing Co. A starter for an induction motor includes an autotransformer with movable core.

1,036,757. Dynamo-Electric Machine. M. Walker, assignor to Westinghouse Electric & Manufacturing Co. The field poles of a rotary converter are provided with closed low-resistance windings around the rear edge portions only.

1,036,760. Plug Coil. E. C. Wilcox, and B. L. Lawton, assignors to Connecticut Telephone & Electric Co., Meriden, Conn. A combined spark plug and coil, the latter including a condenser.

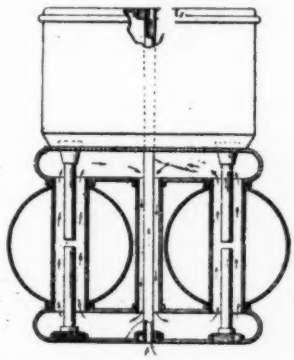
1,036,789. Current-Rectifier System. Q. A. Brackett, assignor to Westinghouse Electric & Manufacturing Co. A mercury-arc rectifier has two inductive coils one winding of which is connected to an anode and the other to the cathode.

1,036,796. Selective Signal. L. W. Carroll, Anamosa, Ia. Includes a set of harmonic vibrators of different frequency.

1,036,805. Telephone. W. W. Dean, assignor to Dean Electric Co., Elyria, O. Gives details of the receiver construction.

1,039,809. Telephone Apparatus. C. F. Dolle, Cincinnati, O. The receiver can be supported against the user's ear.

1,036,815. Arc-Lamp Electrode. G. Egly, assignor to Gebr. Siemens & Co., Berlin, Germany. Contains tungstates of iron and of a rare earth and a fluoride compound.



1036,884.—Regenerative Double Arc Lamp.

1,036,817. Pole Changer. C. J. Erickson, assignor to First Trust & Savings Bank, Chicago, Ill. A vibratory reverser for telephone ringing circuits.

1,036,818. Line Protective Device. J. Erickson, assignor to Automatic Electric Co., Chicago, Ill. A heat-coil set for telephone distributing and terminal boards.

1,036,819. Shade-Holder. R. E. Ewing, assignor to Pittsburgh Lamp, Brass & Glass Co., Pittsburgh, Pa. A band with wide contacting surface is mounted on the socket.

1,036,835. Dynamo-Electric Machine. F. C. Hall, assignor to Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa. A dynamo with a commutator at each end has the respective segments interconnected by leads not influenced by the armature-core flux.

1,036,836. Automotoneer. G. W. Hamilton, assignor to Westinghouse Electric & Manufacturing Co. A motor-controller handle must be turned on only one notch at a time, a ratchet wheel and a star wheel governing its action.

1,036,853. Attachment for Melting Furnaces. R. T. Johnson, assignor to Automatic Furnace Co., New York, N. Y. A motor-driven fan draws off the gases.

1,036,864. Switching Device. J. H. Lehman, New York, N. Y. A rotary

contact-maker revolves in a circular casing.

1,036,868. Electric Switch for Sadirons. C. P. Madsen, assignor to Pelouze Manufacturing Co., Chicago, Ill. Can be moved to on and off positions without stopping ironing.

1,036,869. Alarm Device. J. Marshak, New Haven, Conn., assignor of one-half to S. Goodman. A heat alarm includes a fusible member to close the circuit; also has a test device.

1,036,884. Arc Lamp. W. H. Mott, assignor to National Carbon Co., Cleveland, O. Has two flaming arcs surrounded by transparent up-draft tubes leading to a central down-draft flue to condense and regenerate the gases.

1,036,886. Electric Pump Governor. H. M. P. Murphy, assignor to Westinghouse Air Brake Co., Pittsburgh, Pa. Includes a chamber and automatic valves and control pistons.

1,036,892. Station Indicator. A. J. Pancratz, and F. J. Pancratz, Denver, Colo. Is automatically operated by an electric motor.

1,036,900. Frequency Meter. A. F. Poole, assignor to Holtzer-Cabot Electric Co., Brookline, Mass. The index spindle is operated by a polarized magnet and pallet.

1,036,901. Electric and Steam Locomotive. J. F. Pope, Chicago, and H. V. Bennett, Morton Park, Ill. An oscillating bar connected to the drivers can be actuated by the steam piston or by a pair of motors connected therewith through gears, crank and connecting rod.

1,036,914. System of Electric Current Distribution. H. M. Scheibe, assignor to Westinghouse Electric & Manufacturing Co. Includes an electromagnetically controlled circuit-interrupter.

1,036,933. Transmitter for the Deaf. H. Tideman, Menominee, Mich.. Has two separate concentric conical sound deflectors directed to the resistance cell.

1,036,935 and 1,036,936. Electrical Coil and Method of Making the Same. C. R. Underhill, assignor to Acme Wire Co., New Haven, Conn. Is made of alternate layers of wire and spirally wound insulating tape arranged in different thickness according to the electrical stress between the layers of wire.

1,036,937. Method of Making Electrical Coils. C. R. Underhill, assignor to Acme Wire Co. Describes the method of winding above.

1,036,951. Electrical Distribution System and Apparatus. V. G. Apple, Dayton, O. Includes a combined voltmeter and ammeter that can be connected to either the dynamo or storage battery.

1,036,961. Telephone-Exchange System. E. E. Clement, assignor to North Electric Co., Cleveland, O. Relates to the operators' signals for an automanual system.

1,036,976. Magnetic Chuck. L. W. Downes, Providence, R. I. The magnetic-pole plate has a number of receiving spaces for removable coils.

1,036,977. Multiple-Unit Chuck. L. W. Downes, Providence, R. I. Can be assembled with other like units into a multiple set.

1,036,990. Electric Water-Heater. R. R. Foster, Colton, Cal. Water passes over a series of plates that are electrically heated.

1,036,996. Electric Induction Furnace. A. E. Greene, assignor to American Electric Smelting & Engineering Co., St. Louis, Mo. A three-phase furnace with two magnetic cores and arranged to develop equal power in each secondary.

1,037,016. Electric Current Controller. H. Kaetker, Cincinnati, O. A dashpot governs the speed of the movable member.

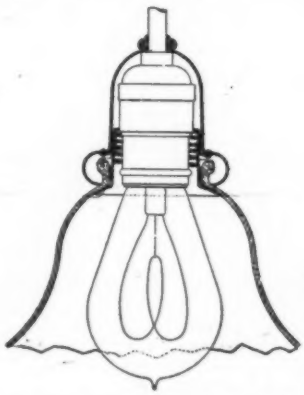
1,037,030. Electric Heater for Watchmakers. P. Lux and F. Lux, Waterbury, Conn. A handle has a plug at one end, a switch in the middle, and a pair of spring fingers to hold, and conduct current to, the article to be heated.

1,037,039. Electric Pump Governor. H. M. P. Murphy, assignor to Westinghouse Air Brake Co., Pittsburgh, Pa. A modification of No. 1,036,886.

1,037,053. Telephone-Call Register. C. V. Richey, Washington, D. C., assignor to Richey Telephone Lock & Call Register Co. A combined lock-out and recording meter.

1,037,059. Electric Bell. H. A. Schmidt, Chicago, Ill. Has an L-shaped permanent magnet along the electromagnets.

1,037,061. Process of Manufacturing Nitrogen Compounds. A. Schweitzer and F. Hauff, Stuttgart, Germany. A mixture is fed through an electrically heated zone.



1,037,101.—Socket-Cover and Shade-Holder.

1,037,074. Make-and-Break Device. C. F. Splitdorf, assignor to Splitdorf Electrical Co., Newark, N. J. Has a rotatively adjustable wearing piece.

1,037,079. Electric Clock. J. W. Swain and H. M. Smith, Clarington, O. Has two electromagnets with a common armature pivoted between them.

1,037,096. Lamp Support. C. H. Wood and J. T. Powers, St. Louis, Mo. A base plate with a clamp and vertical stem for an incandescent lamp.

1,037,101. Combined Socket-Cover and Shade-Holder for Electric-Light Devices. L. W. Andersen, assignor to Plume & Atwood Manufacturing Co., Waterbury, Conn. The shade is held from below by a flanged ring threaded into the socket-cover.

1,037,123. Trolley. F. Bury, Lyndora, Pa., assignor of one-half to J. A. Kalina. Has two guard spools on each side of the wire and in front of the wheel.

1,037,130. Time-Controlled Circuit-Closer. H. P. Christianson, Oakland, Cal., assignor of one-half to A. J. Hanford. A clock moves a finger over the contact segments.

1,037,160. Battery Vault. G. H. MacDonough, assignor to Potter-Winslow Co., Chicago, Ill. The batteries are in a chamber beneath the manhole.

1,037,172. Impulse Transmitter. E. E. Clement, Washington, D. C. A set of push-buttons is adapted to turn a telephone selector wheel through different angles.

1,037,181. Controller for Electric Motors. W. A. Paris, assignor to Westinghouse Electric & Manufacturing Co. Abnormal current conditions or a slight movement toward "off" position releases the control arm.

Patents that Have Expired.

Following is a list of electrical patents (issued by the United States Patent Office) that expired September 3, 1912:

545,469. Electrical Signaling Apparatus. J. H. Fildes, Chicago, Ill.

545,485. Adjustable Support for Electric or other Lamps. L. Goddu, Winchester, Mass.

545,494. Railway Block-Signal System. A. W. Hall, New York, N. Y.

545,495. Support for Overhead Electric Conductors. M. Hanford, Malden, Mass.

545,498. Electric Brake. W. L. Hendenberg, New York, N. Y.

545,524. Electric Motor. J. O'Neil, New York, N. Y.

545,532. Telegraph Key. G. F. Philbrook, Lisbon Falls, Me.

545,553. Electric Igniting Apparatus for Gas Engines. H. Thau, New York, N. Y.

545,554. Alternating-Current Generator or Motor. E. Thomson, Swampscott, Mass.

545,569. Electric Tool and Shoe. H H. Bliss, Washington, D. C.

545,570. Electric Coal or Rock Drill. H. H. Bliss, Washington, D. C.

545,591. Electric Motor. O. E. H. Kramer, St. Louis, Mo.

545,592. Electric Motor. O. E. H. Kramer, St. Louis, Mo.

545,620. Cleat for Electric Wires. M. M. Wood, Chicago, Ill.

549,629. Safety Appliance for Electric Conductors. A. E. Hutchins, Detroit, Mich.

545,653. Electric Alarm. W. S. Hull, Dallas, Tex.

545,664. Method of and Apparatus for Controlling Current for Electric Motors. T. von Zweigbergk, Cleveland, O.

545,670. Electric Transformer. W. P. Brittin, Allegan, Mich.

545,693. Synchronous Motor. M. Hutin and M. Leblanc, Paris, France.

545,694. Electric Arc Lamp. R. H. Jarr, Opladen, Germany.

545,696. Electric Time-Check Receiver. C. K. Jardine, Georgetown, British Guiana.

545,699. Electric Annunciating Target. O. Kauffmann, Sacramento, Cal.

545,726. Indicator. B. B. Rittenhouse, Philadelphia, Pa.

545,736. Electric Arc Lamp. R. Segerdahl, Chicago, Ill.

545,755. Carbon-Holder for Electric Arc Lamps. T. E. Adams, Cleveland, Ohio.

545,815. Electric Signaling Apparatus. B. Price, Baltimore, Md.

545,819. Electric Insulator. D. M. Rotherberger, Lancaster, Pa.

545,833. Bond for Electric Railways. E. S. Wheeler, Sagatuck, Conn.

545,835. Electrical Burglar Alarm. J. R. Alexander, New Albany, Ind.